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A Healthy Export Trade

SEVERAL times in recent months electrical manufacturers have been exhorted not to permit the improvement in home trade armament requirements to lead them to neglect their export markets, lest they should find in leaner times that they have lost their hold on this important trade.

All the available evidence seems to show that this fear is not yet justified. The chairmen of some of the leading electrical manufacturing companies have expressed a full appreciation of the necessity of fostering export trade, and have been able to show that their companies are putting it into practice.

To mention but a few of a number of recent examples: Lord Hirst, at the annual meeting of the G.E.C., gave an excellent account of the company's activities in export markets. A similar report was made by Sir T. O. Callender at the meeting of the cable company bearing his name. Lord Queenborough, at Siemens Bros.' meeting, mentioned a number of contracts received from distant markets, as did Sir Montague Hughman at Henley's meeting. Sir A. N. Lindsay told Reyrolle shareholders that their overseas connection continued to develop.

Sir Alexander Roger said at the annual meeting of B.I. Cables that, although they were exceptionally busy at home, they had no intention of neglecting their overseas business, and Sir Felix Pole, at the A.E.I. meeting, said that, notwithstanding the increase of orders in the home market, their policy was to do everything possible to develop export business.

The impression conveyed by these speeches is reinforced by the Board of Trade returns of electrical exports. The figures for June, which we reproduced last week, show that the export total value reached a point which has only been exceeded once (and that in April this year) since the "boom" year of 1930.

The first half of this year has seen a rise of over 20 per cent. in the value of electrical exports as compared with the corresponding period of last year, thanks to a marked improvement in some of our more important overseas markets—particularly Australia and New Zealand—and to the steady flow of orders from South Africa.

Canada nearly doubled her purchases during the six months, her share being valued at £205,062. This is a continuation of the tendency shown by the figures for 1936 which appear on page 153. But although last year the Dominion imported United Kingdom electrical goods to the value of £248,000, the United States share of this trade was £1,889,200, or over 86 per cent. of the total. There seems to be scope for still further improvement here.

The improvement in foreign markets, to which something like a quarter of our electrical exports go, has not been so marked, amounting to only about 9 per cent. during the first half of this year.

While the figures show the paramount importance of the Empire to the British electrical manufacturing industry, they also indicate a great scope in the rest of the world. Many foreign markets, of course, are virtually closed to our products by reason of exchange difficulties and tariff barriers, but there are others which might be better customers. South America is one part of the world which used to be considered a promising field for our activities, and Argentina is still our best foreign customer. Brazil, too, regularly appears in our export list, but Chile does not receive separate mention. The United States and Germany do well in these countries for various reasons, largely, it is said, because they are ready to adapt their ideas to the inhabitants' requirements.

The same considerations apply in other directions and indicate that the need for close study and proper representation, which has been urged for so many years, still has force. We must not only hold what we have, but continue to expand.

Cheaper Supplies

As from the June meter readings about 150,000 customers of the Metropolitan Electric Supply Co., Ltd., and its associated concerns will be getting their electricity at a much lower rate. The parent company has decided to make the secondary charge of its two-part tariff one-halfpenny a unit all the year round while its associates are instituting a rate of ⅜d. per unit. The latter charge applies to many areas which can be termed "rural" and therefore represents a real advance. There are still other supply authorities nearer London whose charges are not so favourable as this. A concern with comparable territory is the London and Home Counties J.E.A. which still charges ¾d. in the summer and 1d. in the winter in what it calls its "outer zone," while even in the "inner zone" (including several populous districts, such as Surbiton) the charge goes up to ¾d. in winter, being ½d. in the summer.

Hot-plates

In spite of its virtues, the electric hot-plate is subjected to odious comparisons with the gas ring and its defenders are often hard put to it to prove that it is superior. It has to be admitted that specially-made utensils have to be used, but as these have much longer lives than the ordinary types the expense is justified. One trouble has been the variety of hot-plates on the market—good, bad and indifferent—making comparison most difficult. Now the British Standards Institution has issued a Standard Specification laying down tests of speed of boiling, efficiency, length of useful life, and insulation resistance. These should enable the qualities of various patterns to be assessed with some degree of certainty. So far as the consumer is concerned there is another great need which is not always satisfied—tuition in the correct use of the electric hot-plate, with particular reference to the residual heat which is too often wasted.

Factory Accidents

While a somewhat larger number of accidents in factories and workshops last year reflected increased industrial activity, the tendency over the last dozen years has been for a general decline. How much of the improvement may be fairly credited to electricity —due to better lighting and elimination of shafting, among other things—cannot be known. As the number of accidents of an electrical nature has remained practically constant over the same period, in spite of a more than threefold increase of the number of kWh. sold, its beneficial influence may be taken for granted. Electrical accidents now form less than 0.3 per cent. of the total from all causes. The number, although greater than that of the year before, has been exceeded twice within the last seven years, when fewer motors were in service.

The Wheatstone Centenary

The modern electrical industry has been built on the foundation of Faraday's discoveries but its beginning, considered as an industry, sprang from the electric telegraph, the development of which is attributable to Wheatstone and Cooke who gave the first practical demonstration of telegraph operation, between Euston and Camden Town, on July 25th, 1837—a hundred years ago. The two men were not, as is sometimes stated, the inventors of the electric telegraph, for there were earlier workers in the field. But, like Marconi in the sphere of radio communication, they improved and put into wide service ideas which seemed of limited application. Thus, in a sense, they were founders of the electrical industry and of the institutions associated with it. The Institution of Electrical Engineers was originally the Society of Telegraph Engineers and this journal commenced its career with the title *Telegraphic Journal*, the secondary title "and Electrical Review" appearing on our third number. It was not until 1889 that the I.E.E adopted its present style, while we finally dropped the title *Telegraphic Journal* in 1892, the words Electrical Review having received greater prominence since 1882.

Night Baking

One way of treating any official report is to ask what can be got out of it in favour of electrification. The Departmental Committee on Night Baking does not recommend abolition of night work, but it does emphasise the need to improve the conditions of employment. Baking will, therefore, remain to provide a night load, which many undertakings are ready to take on at ½d. per kWh. Much of the hardship and ill-health due to the hours of labour is removed, moreover, if there are no fumes to vitiate the atmosphere. Fewer men need work at night, or their hours can be shortened, where electricity is used for baking. The saying, "It is not what it costs, but what it saves," is peculiarly applicable to breadmaking as the baker is ultimately interested only in his overall charges, from the sack of flour to the bread delivered to his customers. Brick-built fuel-fired ovens are, however, long-lived, and an opportunity to electrify a bakery, if not taken, is unlikely to recur for a very long time.

Supply for the Wirral Rly.

The Court of Appeal last week upheld the decision of Mr. Justice Simonds in the Wirral Railway case. The Minister of Transport had given his consent to the supply of electricity for this railway, which lies in the area of the Birkenhead Corporation, by the Liverpool undertaking. Birkenhead contested the Minister's power to do this, maintaining that the Wirral Railway was a separate undertaking outside the Liverpool supply area. Mr. Justice Simonds held that the railway was an integral part of the London, Midland and Scottish Railway, whose system lies partly in the Liverpool Corporation area. Section 47 of the Electricity (Supply) Act, 1926, on which Liverpool Corporation and the railway company relied, provides that where authorised undertakers are supplying within their district electricity for haulage or traction to any company, etc., with a railway or other undertaking situated partly within and partly without the district, such authorised undertakers may, with the Minister of Transport's consent, supply electricity for use for any purposes of the railway undertaking within or without the area of supply. The Master of the Rolls confirmed the judge's decision that the section covered the present case "beyond the possibility of argument."

To the Diffident

In the course of their careers engineers have many experiences and accumulate stores of useful knowledge which would be of interest and value to others in the profession—particularly to the younger members. Unfortunately, however, the large majority have not the gift of expressing themselves, or diffidently think they have not. They do not appreciate that in this field it is the matter, not the manner, which counts most. In fact, Miltonic English is a difficult instrument to employ for the purpose. All that is needed is straightforward statement, unencumbered by literary adornment, but this is seldom realised by men who really have something useful to say. This has long been our experience, but it is brought more forcibly to our attention by a statement contained in the announcement of the 1937 Highfield Shield Competition organised by the Association of Supervising Electrical Engineers: "The literary style of papers is of minor importance, as the Competition is to encourage papers of a practical nature and original thought." Much the same applies to articles for the technical Press, which employs sub-editors to remedy stylistic deficiencies in articles which are worth publishing.

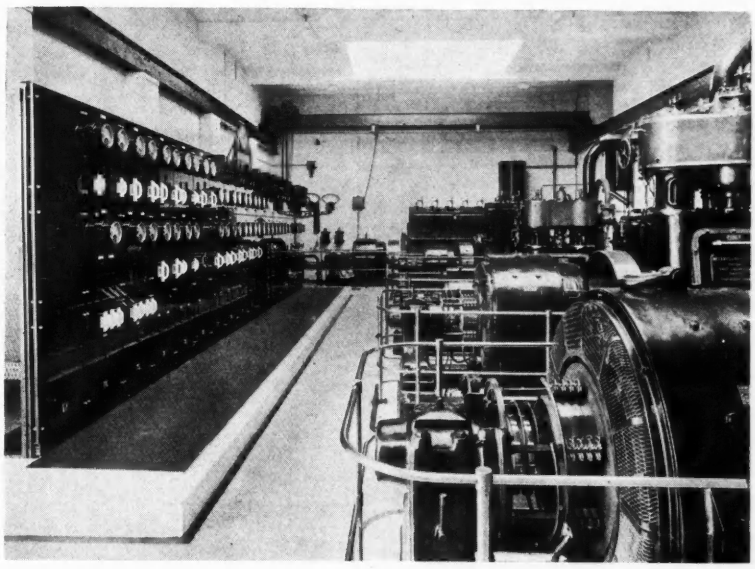
The Runwell Hospital

Large-scale cooking and hot-food distribution by all-electric means

THE hospital for mental and nervous diseases at Runwell, in Essex, which was officially opened last month, is a notable example of the new outlook upon the corrective treatment of disorders of this kind. In place of a purely custodial asylum there has been established an occupational therapy centre that seems already to have initiated a precedent for emulation elsewhere.

Instead of the barracks-type of institution a whole series of low buildings (detached though co-ordinated on the unit principle) has been skilfully planned to create the impression of a reasonably free (and exceedingly well housed) self-contained village community, with the least possible emphasis on the varying degrees of restraint needed by the inmates.

In such a scheme of things environmental atmosphere has a definite remedial value, and the architects (Messrs. Elcock and Sutcliffe) have collaborated to an unusually successful degree in reconciling practical convenience with attractiveness of layout and agreeable design, though the cost of hospitals built in this style is great.



The hospital power house containing 625 kW of plant [*Elec. Rev. photo.*

Runwell has taken three years to build, jointly by the County Boroughs of East Ham and Southend-on-Sea. It has cost £667,324, of which £84,718 was expended on the heating installation (steam and hot water) and £55,675 on the electrical installation, which was carried out under the supervision of Mr. E. W. Dorey (consultant) by Messrs. Bell Bros. (London), Ltd.

The community of 1,400 people, including 1,032 patients, 60 per cent. female, is accommodated in about 30 separate buildings occupying approximately 80 acres of the meadow-like 509-acre site. Each unit is specially planned for its particular purpose, and an electrical feature of the whole is the way in which food is cooked and distributed by equipment supplied by the Jackson Electric Stove Co., Ltd. Apart from domestic-type cookers in the staff houses, nurses' demonstration room and lecture theatre, there are 26 small "unit" kitchens in the individual blocks for the preparation of light meals and special foods. Typical equipment consists of a two-switch hot cupboard with sliding doors, two-switch grill on a floor stand, a separate single hot-plate on a floor stand, a hot-water urn and a single compartment "Frigidaire" refrigerator.

The nurses' home is provided with a large kitchen capable of catering for more than 120 people. It contains a double-compartment "Marboliron" refrigerator, a 22-A steaming oven, two 65.5-A roasting ovens, a twin section 18-A grill with hot cupboard below, a 56-A bain-marie, a central range of eight hot-plates taking 80 A, a two-well fish fryer of 24 kW, two boiler-steamers of 32 A each, 8-A and 12-A urns, a potato-peeling machine and "Peerless" mixer driven by built-in motors, and, finally, an ordinary domestic-type cooker with three hot-plates and oven, all operating at 230 V.

The nurses' home kitchen is self-sufficient. Apart from that the bulk of the foods for the principal meals is prepared in the main kitchen, whence it is distributed hot to the various wards and dining rooms by means of nineteen multi-compartment trolleys of all-metal Jackson design. Each will contain sufficient food for sixty persons and has two sets of heating elements, one for the top compartments containing cooked fruit and sweets and the other for the lower sections containing meats and vegetables.

These trolleys have six wheels and a hand brake operating on the middle pair. They are backed against three loading docks, each accommodating seven trolleys and fitted with plug and socket connectors for their heating while being stocked from the kitchen hot cupboards through folding glass doors.

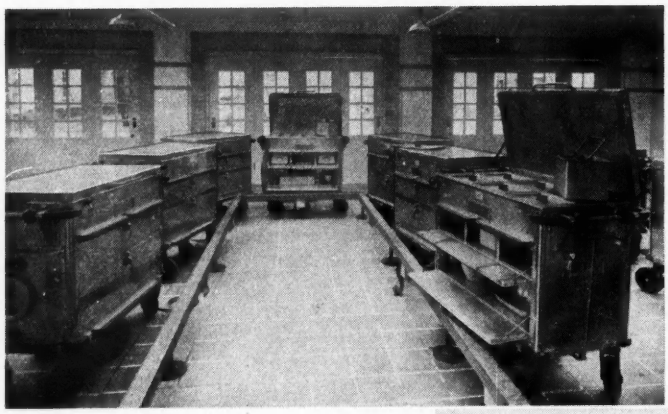
When loaded the trolleys are wheeled out and run into trailer trucks with drop-down sides forming sloping ramps. Each truck carries two trolleys, and the trains of trucks are hauled by two B.E.V. battery trucks, each driven by a single 4-h.p. motor energised by a 40-V "Exide" battery. Plug and socket connectors are provided in the wards for keeping the trolleys warm while being unloaded and the food is being served.

The main kitchen for the preparation of food in bulk which is distributed by the trolleys illustrated on the next page [*Elec. Rev. photo.*

The main kitchen equipment is in three parallel rows. Along the loading bays is a series of steam-heater cupboards and hot tables by Carron Company, which also supplied the central steam-jacketed boilers. The third row is composed of Jackson Electrical appliances, including a twin-section grill, a 170-A table with sixteen hot plates, a 70-A two-deck pastry oven, a range of four roasting ovens, each taking 60.5 A, and a fish fryer with four wells each taking 12 kW, all with three-heat series-parallel two-switch control at 230 V.

At one end are "Peerless" mince-mixer and potato-peeling machines driven by 0.75 h.p. built-in motors. A series of cold storage rooms is grouped round a central pre-

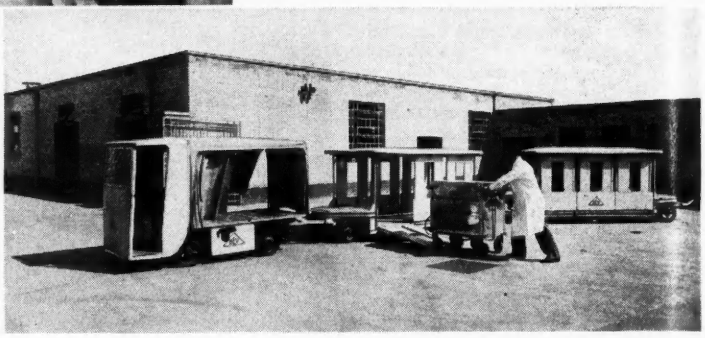
paration bay. A separate chamber houses the associated plant, by the Liverpool Refrigeration Co., which also serves for ice-making. "Teddington" thermostatic control is entirely automatic, the main ammonia compressor being driven by a 15-h.p. variable speed (400/550 r.p.m.) motor, and the brine is circulated by a 3-h.p. motor pump independently to the cold rooms, which are regulated individually by



Hot food distributing trolleys in loading bay [*Elec. Rev. photo.*

motor-operated valves (British Thermostat Co.) functioning in conjunction with Keith Blackman air-circulating fans.

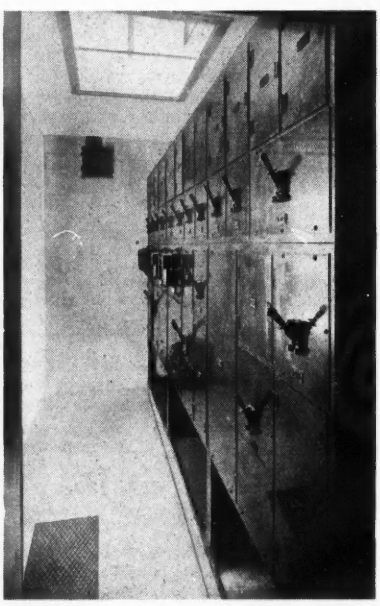
A Marryat & Scott lift serves the food stores, while an electric hoist lifts sacks of flour from outside to the top of the bakehouse, whence the flour is poured through a ceiling



The food-trolley haulage train [*Elec. Rev. photo.*

chute into a combined sifter and dough mixer of "one-sack" capacity, driven by a 4-h.p. motor. There is also a "Peerless" 20-quart cake mixer with three-speed drive by a 0.5-h.p. motor.

The bread-baking oven is of two-deck Baker Perkins make. Each draw-out plate is of "one-sack" capacity, meaning that each accommodates ninety-five 4-lb. loaves. The maximum loading is 78 kW, and, contrary to expectation, it has not so far been necessary to limit the use of the bakery to off-peak periods. The oven is illuminated internally, and there are four temperature dials, thermostatic control being applied by an Igranic contactor panel mounted on top of the oven. The pipe-enclosed heating elements are "seriesed" with a common bonding across the 460-V mains, without bringing in the neutral.



A typical unit distribution switch chamber [*Elec. Rev. photo.*

In the spacious laundry are three rows of Bradford washing machines, belt driven from overhead line-shafting projecting through the end-wall, so that the driving motor of each shaft is on the dry side of the wall. Between each pair of washers is a Broadbent centrifugal hydro-extractor, and other machines include Tullis six-roll and single callenders, steam-heated and motor driven, specially guarded by wire-mesh cages on account of the employment of part-patient labour. Similarly, the Tullis "Imperial" presses, steam-heated and actuated by compressed air, have two-finger control which affords protection by necessitating the simultaneous use of both hands.

The Lister "Gladiron" is loaded to 3 kW for heating and is driven by a ¼-h.p. motor, while the Bradford collar- and cuff-finishing machine has 4 kW heating, the elements within the roller being energised through slip-rings at each end. The two Bradford drying and airing rooms are steam-heated, and have 4-h.p. motor extraction fans; other laundry exhaust fans are of Keith Blackman make.

The ironing table is equipped with seventeen G.E.C. flat-irons with connectors pendent from the ceiling, each with its own switch and pilot lamp, and all fused back on to 12-way distribution boxes. In addition, there are irons of special shapes, goffering iron heaters and cordless irons heated on the plug-in thermal storage principle. The adjacent clothes-mending room is equipped with Singer electric sewing machines and G.E.C. cordless irons.

The power house electrical plant and the majority of the motors employed are of Crompton Parkinson make, with Brookhirst control gear. Steam is produced at 175 lb. per sq. in. in Paxman "Economic" boilers, fired by Bennis air-draught stokers with automatic coal conveyors. The five generators, each with its own static balancer, are driven by Belliss & Morcom engines comprising 55-, 150-, and 200-kW steam-sets and 66- and 155-kW Diesel sets. The solid injection oil engines are used for quick starting and also when diminished demand for process steam limits the number of steam sets in use. Exhaust steam at 5 lb. per sq. in. is passed to four calorifiers for water-heating purposes, the circulating pumps and all auxiliaries being motor-driven.

The 17-panel slate switchboard has central sectional-bulk metering equipment with sub-meters in the principal buildings. The outgoing feeders are divided into power and lighting circuits, all cables being of Henley's armoured type laid direct in the ground, distributing d.c. on the three-wire system at 460 and 230 V.

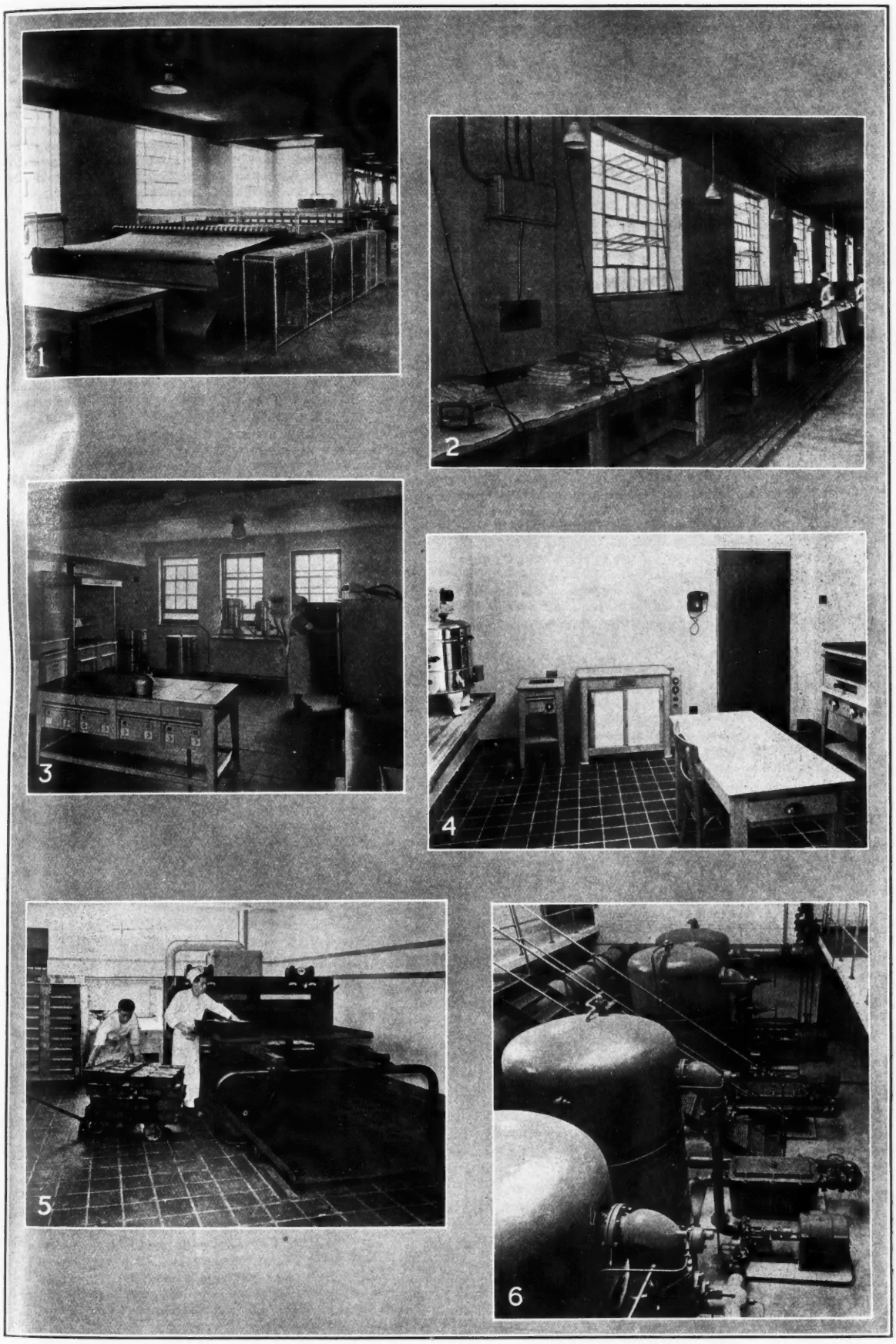
The central kitchen, bakery and laundry are fed direct, whereas all other buildings are served on the ring-main principle, with twenty-four internal distribution switch chambers ("Kartret") in "unit" buildings. The sheet-metal cubicles are neatly code-marked for easy identification, and in these chambers are also placed the loop-in test boxes for the multi-core underground cables needed for such auxiliary services as the "Standard" automatic intercommunicating telephone exchange, Julius Sax fire alarms, Gillett & Johnston electric clocks, and "Tannoy" wireless relay exchange.

These secondary circuits are supplied from a Tudor battery room, which also contains a 230-100-V "Safetylyte" set for automatically maintaining essential lighting circuits, including the Zeiss shadowless lamp in the surgical operating theatre. In addition, there are automatic throw-over switches in the "unit" switch chambers for transferring lighting to power circuits in emergency.

Besides dental equipment (D.M.C., Ltd.), there is a Newton & Wright X-ray outfit (Philips tube), as well as actino-therapy lamps by Hanovia and Schall for light treatment. A series of psychological, pathological, and biochemical laboratories equipped with special electrical apparatus of Gallenkamp, Hearson, Leitz, Baird & Tatlock and other makes enables not only research to be conducted, but also permits experimental investigations upon which the treatment of particular patients can be based.

Then there is a series of occupational-therapy workshops for the teaching of numerous handicrafts, metalwork, carpentry, &c., at present in the course of being equipped with electrically driven plant, together with an outlying farm to which an overhead wood-pole line has been run for power and domestic electrical applications.

General illumination is on straightforward lines. The work-



Large-scale Cooking and Laundry Equipment at Runwell Hospital

1. A corner of the laundry, showing special guard fencing. 2. The long ironing table. 3. A view of the all-electric kitchen in the nurses' home. 4. A typical "unit" kitchen. 5. Electric bread-baking oven, thermostatically controlled. 6. Calorifier circulating pump motors [*Elec. Rev. photos.*

ing spaces are fitted with pendant lamps in Benjamin enamelled reflectors, while the Falk-Stadelmann fittings in the hospital and living quarters are simple, neat ceiling units almost exclusively totally enclosed. Night sisters carry "Alklum" accumulator hand lamps, and in the dormitories there is two-way switching for 60- and 15-W lamps in single fittings. Crabtree flush switches are employed with special dollies, and are specially fixed to prevent unauthorised tampering by patients.

There is generous provision of "Wandsworth" three-pin foolproof plugs and sockets for the use of "Premier" kettles, "Giant Polifor" double-roll floor polishers and such-like appliances. The medical officers' residences have built-in Ferranti fires, while the staff houses are equipped for all-electric cooking, Carron and Burco wash-boilers, &c.

The chapel has a Norman Hill electric organ and Holophane concealed floodlighting, relieved by side-wall brackets of Roman-lamp pattern which are well suited to the unconventional design of the interior. The recreation hall is also equipped with Holophane concealed ceiling lighting, with hand-operated dimming and colour-changing gear for the stage lighting. There is a "Kalee" twin cinema projector and "Invicta" talkie outfit, combined with a gramophone turntable amplifier set.

To conclude this necessarily cursory account of a very completely co-ordinated whole, one may remark that the boldly broad lines of its conception so impress themselves that the sense of depression inevitably associated with a visit to a mental hospital is quite lost in admiration for what has been achieved.

Electric Decorating Kilns. By A. J. G. Smith

Relative efficiency of different intermittent types

ELECTRIC heating had a difficult task in entering the ceramic industry, and its development in that field was at first comparatively slow, although in view of the shortcomings of the average solid-fuel furnace it is the ideal method of heating from the technical point of view.

The electric kiln can be accurately and automatically controlled so as to maintain a temperature within limits of plus or minus 5 deg. C.; moreover the charge can be heated at any required rate, maintained at the peak temperature for any time, and cooled down at a fixed rate, so that the heating curve is under exact and automatic control from the moment the kiln is switched on. Further attendance is then unnecessary until the finished ware is unloaded. No products of combustion enter the kiln, the process is clean, and a better quality of colour is obtainable.

On the Continent a considerable amount of development work has been undertaken on the intermittent kiln with automatic control, operated during the night at low tariffs. For results, these intermittent kilns (which may be either of the trolley or hood type) take an intermediate place between the simple single-chamber and continuous tunnel kilns. In German practice it is stated that no special trouble is experienced with many classes of ceramic ware if they are cooled down below 400 to 500 deg. C. outside the kiln under a suitable hood, allowing the heated kiln at 400 deg. to be used immediately for a fresh charge.

Dr. Rud. Buchkremer has published working results obtained with Riedhammer decorating kilns. The first type is a chamber of sheet steel lined with firebrick and kieselguhr, and heated by nickel-chrome wire elements in the sides and base which are protected against damage by plates in special heat-resisting material. With an effective heating space of about 44 cu. ft. and a rating of 50 kW, the fully charged kiln can be raised to 550 deg. C. in three hours.

An alternative construction is sometimes employed without any firebrick lining, the kiln in this case being double-cased with the space between the two casings packed with insulating material. The following table shows the results obtainable from the two methods of construction for firing glassware, the charge being 264 lb. of ware and 221 lb. of supporting material and the temperature 550 deg. C.

Construction.	Rating kW.	Total kWh.	Heating time, hours.	kWh. per lb. Glass.
Firebrick-lined	50	154	3	0.58
Double-cased	40	94	2½	0.35

Although the brick-lined type has been shown to be less efficient, it possesses the advantage that it can also be used for higher temperatures such as are necessary for decorated porcelain, in which case the rating is increased to 60 kW, while the double-cased type is only suitable for temperatures up to about 600 deg.

In addition the brick-lined kiln cools down very evenly, but there is a tendency with the double-cased type for the temperature fall in front to be greater than at the back of the kiln due to heat loss through the door during the cooling down period.

A trolley kiln of the same capacity as the simple chamber kiln mentioned can be quickly loaded from three sides at once. In order to minimise heat losses through the front of the kiln, the door is built in one piece with the trolley and with the same thickness of insulation as the walls. Further economies can be effected by withdrawing the loaded trolley on completion of the firing and allowing it to cool down under a sheet-metal hood, while another charged trolley is inserted in the kiln.

Similar economies in heating can also be obtained with the hood kiln, but whereas with the trolley type a couple of trolleys are necessary for economical working, with this type two hearths have to be provided to one hood. When the firing of one charge of ware is completed and a partial cooling down effected, the next charge must be loaded on the second hearth so that the heated hood can be transferred immediately to it.

The following table shows the results obtainable from these three types of small kiln for porcelain decoration, of the same capacity (about 44 cu. ft.), each with a charge consisting of 440 lb. of porcelain and 550 lb. of supporting material, the temperature required being 850 deg. C.

Type.	Rating kW.	Total kWh.	Heating time, hr. (approx.).	kWh. per lb. Porcelain.
Chamber	60	269	4 to 4½	0.6
Trolley, cold	60	282	4½	0.6
„ 400 deg. C....	60	232	4	0.5
Hood kiln, cold	60	272	4½	0.6
„ 400 deg. C.	60	222	3½ to 4	0.5

While the foregoing figures do not represent the ultimate possibilities of electric heating for this class of work, especially when applied to continuous tunnel kilns, they show what can be achieved in this way with comparatively small quantities of ware.

Electricity in Factories and Workshops

Chief Inspector's report for 1936

THE report of the Chief Inspector of Factories and Workshops for 1936 (Stationery Office, 2s.) contains many items of an electrical character. Among these is the statement that the interest taken in lighting is increasing, though in some industries (notably cotton and wool) it still leaves much to be desired as regards distribution and intensity and glare. Complaints by trade unions about the lighting of cotton-weaving sheds have brought some improvement, but progress as a whole has been slight and the smaller employer seems unlikely to improve conditions except under compulsion.

The increased use of gaseous-discharge lamps, especially in larger workshops, has for the most part proved successful, but in some instances it has been found that colour differences are neutralised; thus, in a transformer works, lighted by sodium vapour lamps, distinction between the mauve- and black-braided wire used became impossible. Another difficulty is the stroboscopic effect, which causes running machinery to appear stationary or even in reverse. This can, however, be overcome by suitable alteration of the system, though some efficiency may thereby be lost.

Another development is the installation of low-voltage lamps for processes requiring strictly local lighting, such as sewing machines and power presses. An instance of bad lighting was found in a firewood factory subject to the Woodworking Machinery Regulations, which require adequate lighting. Here a circular saw was lighted by two small bicycle lamps, one acetylene and the other electric, placed at the

back of the bench. Their combined light was so poor that ordinary newsprint could not be read near the cutting edge of the saw.

The total number of accidents (the injured person being the unit) reported was 176,390, of which 920 were fatal, representing increases of 18 and 9 per cent. over the corresponding figures for 1935. There were also more electrical accidents in factories and generating stations, a total of 520 (31 fatal) comparing with 447 (23 fatal) in 1935. The increase was solely among workers unskilled in electrical matters, whereas for the previous year it was mainly in the skilled class.

Fifty-seven of the electrical accidents reported (nine fatal) occurred in generating stations and forty-eight (two fatal) in electrical engineering works. The total number of accidents from all causes was 916 (17 fatal) in the first case and 6,039 (13 fatal) in the second.

Persons employed in 1935 in generating stations numbered 34,586, of whom 31,792 were males (1,110 under eighteen years of age). In electrical engineering works the total was 196,722. Of the 127,320 males, 22,383 were under eighteen years, and of the 69,402 females 16,888 were under that age. There were fifteen cases of lead poisoning in electric accumulator works, but none proved fatal. Electrical engineering is grouped as an industry with " average accident rates " (2,582 per 100,000 in 1935), as distinct from " high " and " low," and has a more favourable record than any of the engineering trades, which are mostly in the " high " group.

A feature of the electrical accidents continues to be the large proportion (55 per cent.) of burns alone, while the incidence of " eye flash " cases has grown, mainly due to expansion of arc-welding processes and exposure of more workers to rays from the arc. In 162 cases (31.5 per cent.) electric shock was involved which included 25 of the 30 fatal accidents.

There has been a steady increase in the number of accidents to male persons under 21 during the last five years, the proportion this year being 19 per cent. of the total.

The conditions with regard to electrical plant on buildings in course of construction give anxiety. In addition to the temporary nature of the installation, the service conditions are extremely severe and the presence of different contractors on the site leads to unauthorised interference. The most frequent causes of accidents are non-earthed metal lampholders, screw-cap lampholders without protection for the lamp cap, cables installed without protection in positions where they are liable to damage, and failure or lack of the earth connection for portable tools. The use of a low-voltage supply, which is entirely practicable, would considerably increase the safety of these installations.

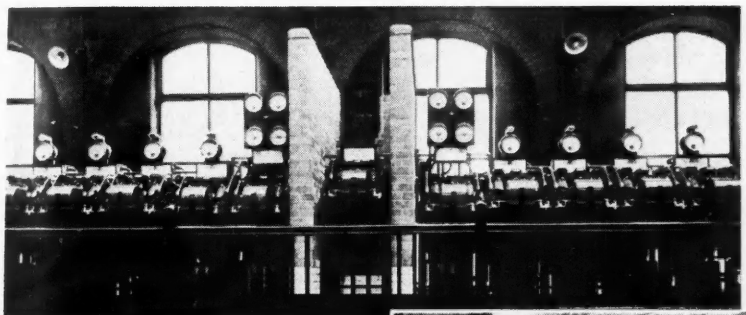
The question of limiting the effects of any breakdown in a major electricity supply station continues to receive attention in relation to protection against excess current under Regulation 8. Progress has been made in the application of " bus-zone " protective gear which is designed either to give automatic isolation of the faulty section or indication to the control room.

All apparatus now certified flameproof by the Mines Department will be marked to indicate for which group of gases it has been certified, and, as research proceeds, the names of various gases and vapours will be allotted to the appropriate group. Flameproof apparatus considered safe for use in atmospheres containing coal and coke-oven gases has become available for the first time during the year. Certificates have been issued by the Chief Inspector for electrical apparatus for use in inflammable atmospheres on the grounds of " intrinsic safety," *i.e.*, the electrical energy involved in the circuits concerned is not sufficient to effect ignition of the surrounding atmosphere.

Apparatus of this type is tested by the Mines Department Testing Station at Buxton before the certificate is issued. The arrangement affords a practical alternative in some cases where the provision of standard flameproof equipment is not feasible.

Three-phase System Inaugurated at Morley

THE supply of three-phase a.c. to the Morley Corporation (Yorks) electricity undertaking was inaugurated on July 15th by Mr. Alan N. East, representing the Electricity Commissioners. The Mayor (Councillor Brian Barker) outlined the events that had led up to the adoption of the £60,000 scheme and paid tribute to Mr. N. Hunter (borough electrical engineer) who had acted as consulting engineer on behalf of the Corporation.



Left: The 11-kV 600-A Reyrolle main board. Below: A group at the inauguration—(from left to right)—Ald. Hepworth (chairman, Electricity Committee), Mr. A. N. East, Councillor Barker (Mayor), Councillor H. Smith (Deputy-Mayor), Mr. N. Hunter (Borough Electrical Engineer), and Mr. W. B. Woodhouse (Yorks E.P. Co.)

Mr. East, after switching on the new supply, commented on the various safety precautions included in the scheme, and the borough electrical engineer then described the installation which comprises an 11-panel 11-kV 600-A Reyrolle metal-clad main switchboard, with two 0.3 sq. in. incoming feeders from Leeds Corporation, an interconnector, and eight ring-main switches.

The system is divided into four rings, each 3 by 0.25 sq. in., cable with 7-core pilot cable for " Solkor " protection and telephone communication between sub-stations. There are ten sub-stations in the original lay-out, all brick buildings, and a feature of these is the brick partition walls separating the high- and low-voltage switchgear and transformers.

All the cables are stripped down to the lead sheath on entering the trenches, and sealed off, and the trenches are filled with pebble-dash.

A feature of the main switchboard is the 14-in. barrier walls on each side of the interconnector, thus completely isolating each section of the ring mains. The low-voltage switchgear is of Reyrolle manufacture and is also totally enclosed metalclad throughout. There is intertripping connection between the high- and low-voltage switchgear in the sub-stations. The transformers are of the indoor type with off-load tapping switches, varying in size from 150 to 500 kVA, and have been supplied by C. A. Parsons & Co. The cables have been supplied, laid and jointed by W. T. Glover & Co.

The gathering afterwards proceeded to the new electricity showrooms, which were declared open by Mr. East and luncheon was subsequently served at the Town Hall. The usual toasts followed, and the ceremony concluded with a presentation of an electric chiming clock on behalf of the contractors to Ald. Hepworth, chairman of the Electricity Committee.

Distribution Development. By T. Kearns

Obtaining maximum results from expenditure

AN examination of the current Statistical Returns of the Electricity Commissioners indicates that distribution charges are a large proportion of the cost per kWh. This, in some measure, is to be expected with the grid's effect on generation costs. Other factors which influence this matter are, of course, the more liberal attitude at present prevalent in regard to capital laid down for future return; rural electrification; smaller average consumptions; and more stringent requirements as to quality and reliability of supply, especially in view of the widespread use of heating and cooking apparatus.

Mr. T. Kearns is a member of the technical staff of the Manchester Corporation Electricity Department

Despite this, however, it is safe to say that generally in the past far more attention has been paid to generation economies than to savings in distribution.

This is confirmed by the present high standard of generation plant with all its refinements to obtain the maximum thermal efficiency, and there is apparently little scope in this direction for any appreciable saving in costs which is essential if the electrical industry is to advance into the competitive market with its large potential demand; and it is to distribution, therefore, that we must turn for future economies. It must be made clear at the outset that a parsimonious attitude is not advocated, but a reasonable balance is possible between this and the other extreme, if careful consideration is taken in each instance of distribution development.

Co-ordination Between Sections

The main economies to be gained are effected by planning ahead each section of the system, so far as is reasonably possible, in its entirety, and by always working towards the ultimate layout. This is only possible if full co-ordination exists between all sections of the department, and it is suggested that the personnel of all undertakings, especially the larger ones, should include an engineer whose duty it would be to obtain the maximum results from distribution outlay. The staff and duties would, of course, vary with the type and size of undertaking, but most of the following is generally applicable and is in successful operation by a few of the large undertakings:—

The distribution development engineer and his section would be responsible for the design of all e.h.v. and l.v. systems, and be free from the harassing but important work of maintenance and operation.

Large extensions and alterations affecting this particular matter would, of course, be decided upon after due conference with the engineers responsible for the installation, operation, and maintenance of the various sections of the system, who, from time to time, would submit recommendations for extensions or alterations required for the satisfactory performance of their duties.

Reliable and easily accessible records are essential for the efficient working of the distribution development section. Records of cable routes, &c., services and connections would be under the direct control of the section, and these requirements are described more fully later. Other particulars are of course necessary, and these should be received periodically, the most useful being: Transformer changes; loads on sub-stations, transformers, cables; progress of work, &c. Files for newspaper cuttings of building and road developments are also useful if carefully indexed.

Routine Duties

Particulars of new applications would be obtained by the sales staff who, if necessary, for example in the case of extensions of network, would arrange for potential consumers to be canvassed. These details, together with estimated revenue, demand and prospects would be forwarded to the section, where, if the applications were acceptable, the method of supply would be arranged, and a plan (1/500th full scale) made and sent to the mains engineer, whose staff would supervise the carrying out of the work.

In the case of a prospective consumer with a large demand, should the section decide that the supply should be e.h.v., the engineers concerned would be notified of the requirements with regard to e.h.v. (and l.v. if necessary) cables and load, and a plan prepared for the requisite cable work.

A portion of the testing staff would be allocated to the section for the purpose of making any tests necessary to ensure satisfactory and adequate supply, and also to investigate consumers' complaints. Should these tests or the furtherance of the ultimate layout require network extensions or reinforcements, then a plan would be prepared as above for the cable work; if a new sub-station were required, then a suitable site would be obtained, and particulars of load requirements, &c., issued to the engineers, as in the case of the new e.h.v. consumer.

A continual survey of supply voltage conditions at strategic points on the networks could also be maintained, and the appropriate tap setting to be used at the various sub-stations specified from time to time by the section, as occasion demanded.

All mains extensions and alterations in connection with a change over could also be arranged by the section, and plans of the work, together with lists of consumers involved, issued from time to time to the engineers concerned, in accordance with a prearranged programme, and also to cater for any new loads of importance.

Statistics and Records

Certain statistics could be compiled by the section, the most useful being costs of all new distribution work; relevant particulars of supply to certain classes of consumers; system losses; load curves, &c. These figures are, of course, invaluable for the purpose of annual estimates, and also for tariff planning, and "off-peak" loading.

Mains records would be under the control of the distribution development engineer, and would comprise in the main:—(*a*) A complete set of 1/500th full-scale Ordnance sheets kept up to date with particulars of cables, pipes, &c. (*b*) Two books of sheets (e.h.v. and l.v.) corresponding to the 1/2,500th Ordnance sheets, but with no details—streets, buildings, &c.—other than cables, sub-stations and disconnecting boxes, all to scale and connections indicated.

These records would be kept up to date by the following procedure: Field sketches of the completed work would be passed in by the sketchers (service sketches done by the jointers) and these plotted in full detail on the negatives taken off the 1/500th sheets, and used in the first place for the issue of the necessary plans of the proposed work to the mains engineer.

These negatives and jointers' sketches would be eventually filed in "street envelopes" under the appropriate sub-station (h.v. work filed in "feeder envelopes") after passing through the hands of the staff responsible for (1) the maintenance of the 1/2,500th diagrams (no services shown); (2) the 1/500th Ordnance sheets; (3) the "balancing sheets."

Maintaining Load Balance

The last could consist of flexible load records in the form of folders of sheets for each section of distributor, giving the total load in details as follows: Names of consumers (in correct order), types and phase connections of services, with the installed load on each phase divided into "lighting," "heating," "cooking" and "power." Obviously, the total connected load on a sub-station, &c., could be quickly ascertainable from these sheets, which would also be extremely useful for change-over purposes. One of the chief duties of the balancing staff would be to specify the phase (or polarity) on d.c. networks) and size of all new services and also to ensure a correct load balance on all network alterations—this is specially important where lengths of three-core distributors have been utilised after change-over.

The foregoing are the chief records of interest, but of course other duties of the normal mains record office would also be carried on.

It has not been possible in an article of this length to describe fully all the possible activities of a distribution development section, which would have for its primary object a distribution system laid down on sound economic and electrical principles, furnishing satisfactory supply to all existing consumers, with sufficient flexibility to cater for all new load of any description, whether the supply is given from existing mains or by cables run from conveniently situated feeding points.

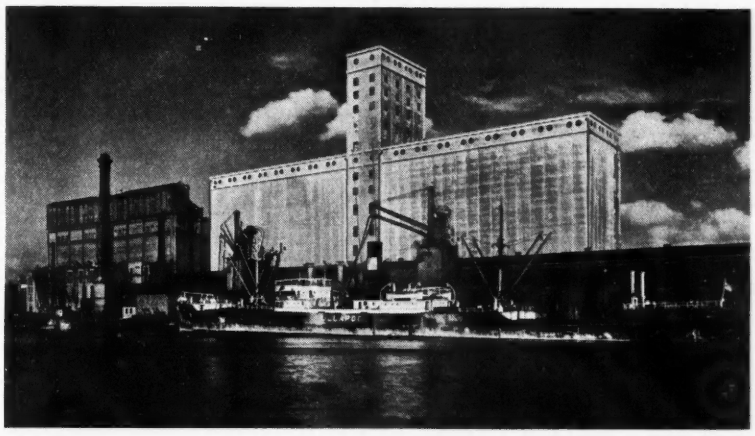
The maintenance and compilation of records has been gone into rather fully because it cannot be too strongly emphasised that reliable and easily accessible records result in the saving of much time and money, and are vital to the successful operation of the scheme described.

A Dock Granary Installation

Electricity extensively used at a Liverpool silo

THE new grain silo at the Brunswick Dock, Liverpool, recently erected for the Liverpool Grain Storage & Transit Co., Ltd., which will work in conjunction with the Coburg granary, is claimed to be the most advanced, both in structure and operating equipment, of any in the British Isles or on the Continent.

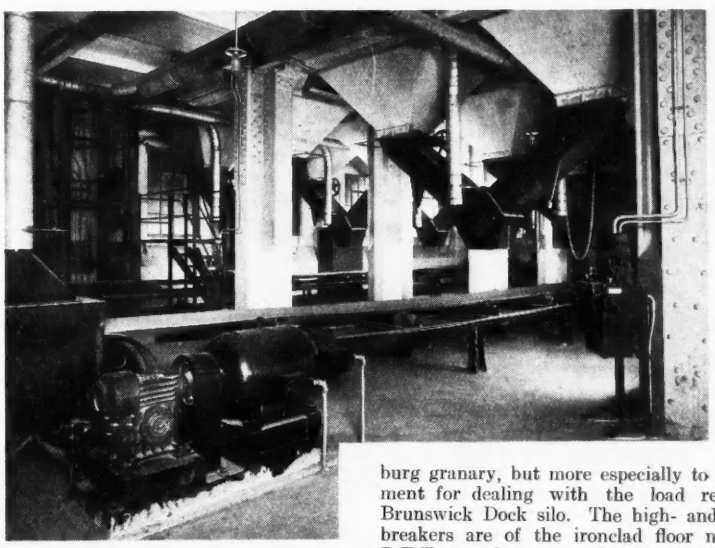
The overall length of the main structure is 420 ft. and the height of the central elevator tower is 232 ft., the silo blocks, one on each side of the central machinery tower, being 145 ft. in height.



A view of the Brunswick Dock granary showing the intake equipment

A feature in the design throughout is that the consulting engineer, Mr. W. Littlejohn Philip, has given great consideration to simplicity of layout compared with older designs, to secure visibility, accessibility and low operating cost.

The new silo has been erected on the site of an existing dock shed, one half of which has been retained for dealing with cargoes other than bulk grain. It has been so constructed that the bin space is divided into two equal blocks, each consisting of approximately 140 bins, the space between the two blocks being the working house wherein the machinery is largely situated and the grain weighed and cleaned.

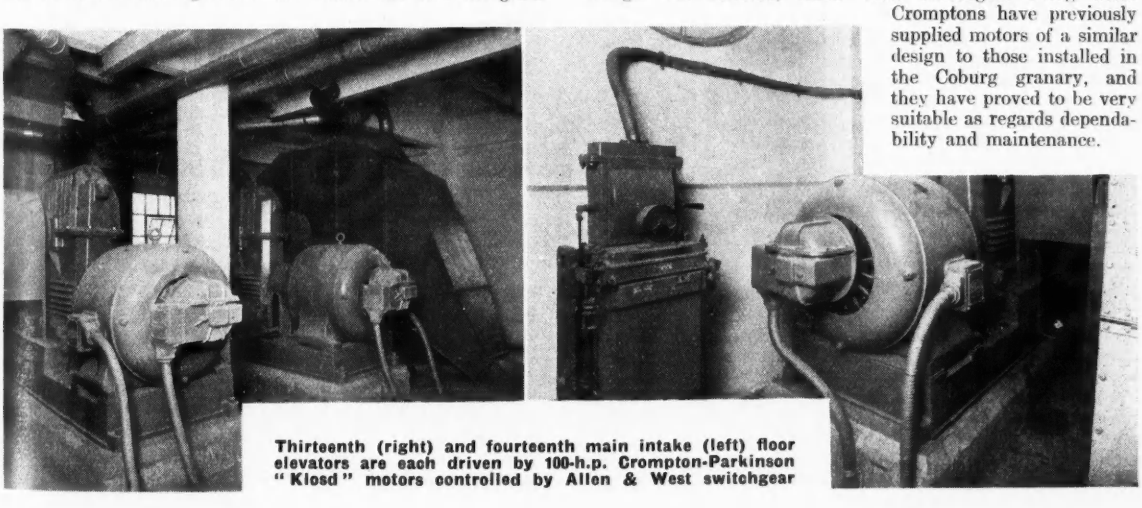


Conveyors below the bins driven by 10-h.p. motors

The intake for bulk grain from ships is by means of two suction plants, each driven by a Crompton-Parkinson 350-h.p. motor, and of a combined capacity of 600 tons per hour. The two intakes deliver to conveyors which transfer the grain to the new silo or deliver it to the Coburg granary. Horizontal and vertical conveyors deliver the grain to the main intake elevators in the working house of the new silo. The elevator heads are arranged at the fourteenth floor of the working house, and deliver the grain to the automatic weighing machines and thence to conveyors situated on the eighth floor, which is the main distributing floor to the various bins. There are four of these conveyors in each block and they feed the bins by means of travelling throw-offs. From the bins the grain is delivered by gravity on the the ground-floor conveyors. Secondary elevators are also installed for delivering the grain to separators when grain is required to be cleaned. The plant has been so arranged that during intake operations a further four elevators can be used for internal use, *i.e.*, weighing, cleaning, turning over or delivering. In each line there is a recording device which provides a record of grain temperature at any height in the bin. If the temperature is higher than that which is desired, the grain can be passed along the conveyors and turned over for cooling in this way. All conveyors and elevator drives are electrically interlocked so that the sequence of operation is preserved.

The sub-station was constructed as a part of the main building to house the equipment of an existing sub-station feeding the pneumatic intake plant, and providing a small supply to Coburg granary, but more especially to provide electrical equipment for dealing with the load requirements of the new Brunswick Dock silo. The high- and low-voltage oil circuit-breakers are of the ironclad floor mounting design. The B.E.T. transformers, each of a capacity of 1,000 kVA, receive power from the Mersey Docks and Harbour Board at 6,000 V. They are of the oil-immersed natural cooled type and distribute power at 400 and 230 V for the motors and lighting respectively.

The motors and starters installed in the new silo and intake plant, of which there are over forty, ranging in power from 7.5 to 350 h.p. each, total over 1,700 h.p. Crompton Parkinson, Ltd., were entrusted with the motors, and the "Klosd" design was selected, Allen West switchgear being used. Cromptons have previously supplied motors of a similar design to those installed in the Coburg granary, and they have proved to be very suitable as regards dependability and maintenance.



Thirteenth (right) and fourteenth main intake (left) floor elevators are each driven by 100-h.p. Crompton-Parkinson "Klosd" motors controlled by Allen & West switchgear

The Montmartre Cable Railway

Details of the electrical gear

AS far back as 1900 a private concern built a cable railway in Paris connecting the Place Saint Pierre with the Sacré Cœur Cathedral on the heights of Montmartre. The line was operated until 1931 when it was closed down owing to its rolling stock and other plant being no longer equal to modern requirements. For a long time

A general view of the track and cars

its place was partially taken by a motor bus service, but eventually the Société des Transports en Commun de la Région Parisienne (S.T.C.R.P.), which is nowadays responsible for all public transport services in the French capital, constructed an entirely new electrically operated cable railway, which was opened to the public last year.

The vertical distance between the upper and lower stations is about 119 ft. and the length of the double rail track, which has a gauge of approximately 4 ft. 7 in., is 377 ft. Owing to the loose nature of the earth on which the line runs it was necessary to cover it with a thick layer of ferro-concrete on which the electrically welded rails are laid. The line is provided with the usual pair of coaches, one ascending and one descending, operated by an automatically controlled electrically driven winding engine, the journey from one station to the other now taking only 1 min. 5 sec. At the stations there are five bays, one for each coach, a central one for passenger loading, and one on each side for exit purposes.

The electric winding plant is below the upper station, and in order to obviate any vibration being transmitted to the building it is mounted on its own solid foundation in which a layer of agglomerated cork is introduced. The winder comprises two separate drums, each approximately 7 ft. 2½ in. in diameter, to receive the traction cable, which has an outside diameter of 28.8 mm. The two drums run in opposite directions, each being mounted on a separate shaft and driven through a helicoidal gear ring which meshes on one side directly with a pinion and on the other through the additional wheel with another pinion. The pinion shafts are connected to the bevel gearing driven by the shunt-wound electric motor continuously rated at 50 h.p. at 1,000 r.p.m. Flexible couplings are fitted on the motor and pinion shafts, a band brake being also provided round the main clutch. Similar band brakes are also fitted at one end of the two winding drums.

In designing the control gear, a good deal of attention was paid to securing, independently of the varying load, when the coaches are approaching the terminal points, a sufficiently low speed to ensure final stopping exactly at the platform levels. The electrical equipment is practically all below the floor of the upper station. The hand operated gear (regulator and resistances) is between the two tracks, where the operator can see the position of the coaches.

For automatic working, the power circuit is dependent on a control circuit, which is itself dependent on two safety circuits. In the case of the motor circuit, a group of contactors provides (*a*) for the progressive starting of the motor by means of a series of five resistances inserted in the armature circuit; (*b*) for normal running; (*c*) for the slowing down of the coaches before stopping by linking up the armature with a potentiometer which provides a progressively reducing potential, and (*d*) the final stopping of the coaches. The automatic apparatus can be set in action from either terminal station or from either of the coaches. The coaches accelerate at a rate which allows the normal speed of 6½ ft. per second to be attained in about 10 seconds and a selector-distributor connected with one of the rotating cable drums operates cams which control the slowing-down action.

The coaches cannot be started until both safety circuits are closed and the opening of either will bring the vehicles to a stop. The stopping circuit is always open, and the brake remains applied when (1) the doors of the coaches are open, (2) when the "stop" button switches at the stations or in the coaches are operated, or (3) when the emergency "alarm" button in the coaches is pushed by a passenger.

The emergency brake circuit is broken when (1) the cut-out operates either owing to lack of or excess of voltage; (2) when a centrifugal governor on the motor shaft comes into action, *i.e.*, when the speed attains 110 per cent. of the normal; (3) should the electrical slowing-down control apparatus fail to reduce the rate of travel to the desired speed, and (4) should there be a tendency for the coaches to travel beyond the definite stopping position. There is also a centrifugal governor connected with one of the winding drums which controls the slowing-down action at speeds between 1.64 and 10 ft. per sec., this governor mechanically bringing about the application of the emergency brakes, and cutting off the traction power.

Each coach is provided with four trolley wires alongside the rail track, one for the vehicle lighting circuits, one for train starting, one for speed control, and one common return wire. Each of the two coaches has room for fifty passengers.

As a protection against accident, in case of cable breakage a device on the coach underframe brings four rail grippers into action. There is an additional hand-operated brake.

The normal working of the coaches is entirely automatically

Entrance to machine room below upper station

controlled, only two men being employed, one at the top and one at the lower station. At the slack periods of the day only one man is employed. He travels in the one coach used for passengers and carries out all the necessary starting and stopping operations by means of the control apparatus fitted in the vehicles.

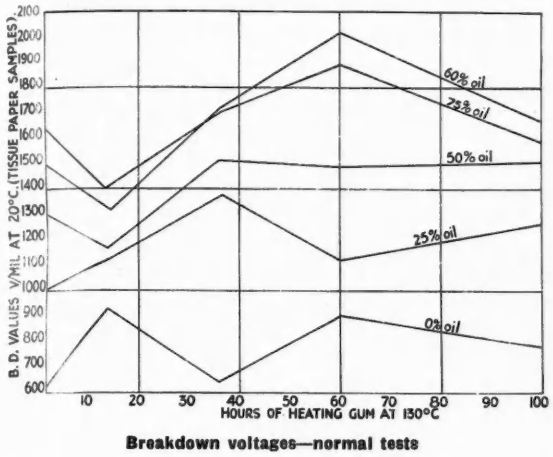
The electrical equipment work was carried out by three concerns—the Société l'Electrification Nouvelle (R. Blanquart), the Société le Matériel Electrique S.W., and the Société Télémecanique-Electrique. We are indebted to Monsieur L. Bacqueyrisse, the chief technical engineer of the S.T.C.R.P., for the accompanying illustrations.

A New Insulating Material

The electrical properties of "Rubbone"

RESEARCH carried out on behalf of the Rubber Growers' Association has resulted in the production of a viscous gum by the catalytic oxidation of rubber to which the name "Rubbone" has been given. Work has been carried out by Mr. G. A. Gillman on material tentatively called "Rubbone B," in which about 10 per cent. of oxygen was added to the rubber molecule, which becomes approximately $C_{15}H_{15}O$. This product is soluble in "white spirit," aromatic hydrocarbons, acetone and chlorinated solvents but not in alcohol.

The material is affected by heat in two ways, sometimes simultaneously. If heated out of contact with air it slowly polymerises, the viscosity increases, and eventually the gum forms a gel which is tacky at first but becomes stiffer and



Breakdown voltages—normal tests

loses its tack with continued heating. In the presence of air "Rubbone" (particularly when in the form of a thin film) oxidises further, the resultant product being a hard brittle resin.

"Rubbone" mixed with drying oils (of which "stand oil" has proved to be the best) produces a finished baked film which is flexible and resistant to solvents and oils. By mixing it with stand oil polymerisation is retarded very considerably. The use of oil is therefore of more benefit when oxidised baked films are required. The costly running of hard gums for varnish making is obviated, as stand oil has only to be added to a solution of "Rubbone" in a suitable solvent, *e.g.*, benzene, toluene or solvent naphtha. Electrical properties vary according to the mixture used.

Tests of Insulating Value

The insulating value of the gum in its fluid state and the effects produced by repeated discharges were investigated by pouring about 300 cu. cm. without previous conditioning into a standard oil-test cup with 4 mm. gap. Breakdown voltage was ascertained every twenty-four hours for fifteen days, the voltage being raised at the rate of 1 kV per second, allowing one minute at 30 and 60 kV. The first test gave 64 kV and the fifteenth 61 kV, showing that the dielectric properties were not impaired. The carbon produced by fifteen discharges was thus very small and the gum evinced little affinity for moisture.

The sample was next subjected to a continuous voltage of 25 kV for sixty-six days. The gap was opened to about 10 mm., but was set at 4 mm. during the test. On the first day the breakdown voltage was 61 kV, on the twenty-sixth 43 kV, on the fortieth 33 kV and on the last 42 kV.

A series of tests was conducted under the above conditions on a large sample of polymerised "Rubbone" which had been maintained at 130 deg. C. The kV rose from 57 after eight hours heating to 76 after twenty-seven hours, thereafter declining steadily to 61 kV at the sixth and last test. The possibility of there being a peak value between twenty and thirty hours was not confirmed, although it was again indicated when dealing with mixtures. Average values of a large number of tests on paper and press board treated with "Rubbone" and baked until dry to the touch were as shown in the following table:—

	Baking hours.	Thickness mils.	Breakdown Voltage per mil.
Tissue paper (1 mil) ...	4	3.5	625
Pressboard (5 mil) ...	17	11.4	685

Tests carried out according to the cable manufacturers' specification gave the following values of specific resistance in ohms per cu. cm.; (1) at 70 deg. C. after three hours at 110 deg. C., 2.2×10^{9}; (2) at 20 deg. C. on cooling 2.8×10^{11}; (3) at 70 deg. C. after fifty hours at 120 deg. C. in contact with copper, 1.0×10^{10}. The high figure obtained in the third case was due possibly to polymerisation after the lengthy heat treatment.

The result of power-factor tests are unsatisfactory and appear inconsistent with other electrical data. The figure is comparable with ordinary v.i.r., but rises rapidly with increasing temperature.

Preliminary tests indicated that the breakdown value was considerably improved by adding stand oil and the effect of heat on the viscosity of various mixtures and retarding of polymerisation was clearly marked. Test papers treated with drying oils and with mixtures gave the following average breakdown values in volts per mil:—Boiled linseed oil, 1,180; I.C.I. stand oil 1,426; "Rubbone," 680; "Rubbone"+30 per cent. stand oil, 945; "Rubbone"+40 per cent. stand oil, 1,098; "Rubbone"+60 per cent. stand oil, 1,150. The addition of China wood oil increased the breakdown values, but it showed poor ageing properties. In order to determine the effect of heating as well as of admixture with stand oil, 2 gal. of "Rubbone B" were placed in an oven at 130 deg. C. The gum formed a hard gel at approximately 112 hr. Five samples were taken out at each of five stages between 0 and 100 hr. and stand oil was added in the percentages of 0, 25, 50, 60 and 75, with benzole to thin down the solution to a suitable specific gravity.

Six samples of films on 1 mil. tissue paper were made of each of the twenty-five solutions. Two samples were tested for breakdown voltage as treated, two for breakdown after twenty-four hours in 95 per cent. humidity, and the other two were used for check tests. The results obtained in some of these tests are shown in the accompanying diagrams. No great advantage seems to be derived from the heat treatment, whilst the moisture resistance of the untreated material appears to be decreased by it.

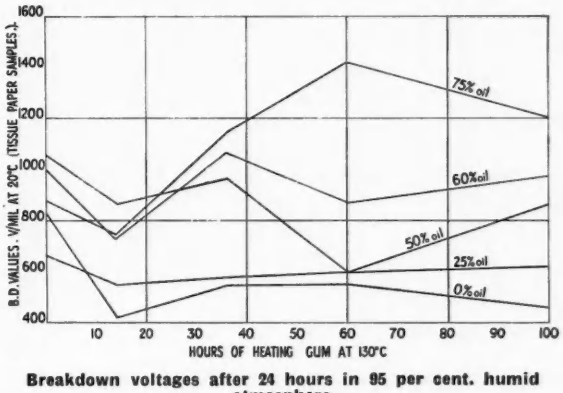
Dielectric tests on 1 mil. tissue paper gave the following comparisons of breakdown values:—

	Baking time hours.	Temp. deg. C.	V. per mil. 20 deg. C.	24 hr., 95% humidity.
Clear baking coil varnish { 1st coat	23	95	1218	
Clear baking coil varnish { 2nd coat	20	110	1765	1115
Rubbone 40%, stand oil 60% ... ... { 1st coat	23	95	1394	
Rubbone 40%, stand oil 60% ... ... { 2nd coat	20	110	1750	1110
Black baking varnish ... { 1st coat	23	95	1359	
Black baking varnish ... { 2nd coat	20	110	1492	1035

Rubbone varnish would therefore appear to be as good as other standard varnishes.

Treatment of Asbestos

Further investigations have indicated numerous possible applications of the material and its mixtures in the electrical

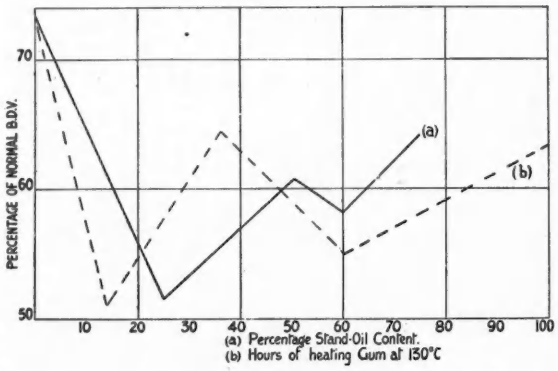


Breakdown voltages after 24 hours in 95 per cent. humid atmosphere

industry. Thus the flexibility and strength of films after baking can be utilised, for example, to improve the mechanical strength and dielectric qualities of asbestos paper. Treated paper baked at temperatures in excess of 200 deg. C. possesses a high degree of flexibility which is maintained even after sixty hours at 100 deg. C. By using a paper treating plant it should be possible to process asbestos paper from rolls continuously.

Asbestos boards, made by treating paper with the varnish,

baking between 150 and 170 deg. C. and pressing at 230 deg. C. and at 1,000 lb. per sq. in. and cooling under pressure, gave an average breakdown value of 100 V per mil. The best results were obtained with slower baking times at from 100 to 140 deg.



Breakdown voltages with various proportions of stand oil and varying heating periods after 24 hr. in 95 per cent. humid atmosphere

C., as paper prepared by short-time baking at 200 to 250 deg. C. does not harden throughout. A roll of asbestos tape varnished with a mixture composed of 40 per cent. gelled "Rubbone" and 60 per cent. stand oil was treated continuously by passing 14 to 18 in. per min. through a tube oven at a temperature of 270 deg. to 300 deg. C. At this speed the tape was tacky but could be unrolled easily after four weeks.

Surface discharge tests of this tape with a 1 in. gap gave an average value of 6.5 kV, this being 2 kV better than similar tests carried out on tapes treated with other insulating oils and varnishes. One half overlap layer of treated and untreated tapes were wound on ½ in. rods and dielectric tests were taken through the tape layer. The untreated (dried) tape, 9 mil. thick, gave 78 V per m. and the treated tape, 12 mil., gave 105 V per mil.

Tests carried out for the surface protection of bakelite paper tubes and condenser terminals were carried out on greaseproof paper. The mixture used was 40 per cent. "Rubbone B" and 60 per cent. stand oil with benzole as solvent. Similar tubes were treated by the same process, but using standard varnish and a gelled "Rubbone" and stand oil mixture in similar proportions.

Water absorption was tested by immersion for twenty-four hours and for seven days, when the increase in weight of standard varnish was respectively 1.34 and 6.75; of the "Rubbone B" mixture 0.71 and 5.40; and of the gelled "Rubbone" 0.565 and 2.24. The materials were slightly less tough than the standard varnish and the baking time of the latter was considerably shorter than that of the "Rubbone" mixtures, but the addition of 0.4 to 0.7 per cent. of lead manganese drier improved this.

Treatment of Copper Wire

For enamelling copper wires for electrical use, the mixture giving the best results is a 60/40 I.C.I. stand oil gelled "Rubbone B" mixture, with benzole solvent, baked at from 300 to 400 deg. C., and an overall thickness of coat of 0.5–1.0 mil. The breakdown voltage per mil. with two coats (1.35 mil. overall) was 1,810 and with the application of four coats (3.5 mil.) 2,310.

Iron sheets as used for transformer cores were treated with a similar mixture to that used for the copper-foil and baked for 60 or 70 sec. at the same temperature, when the mean breakdown voltage was 770 V.

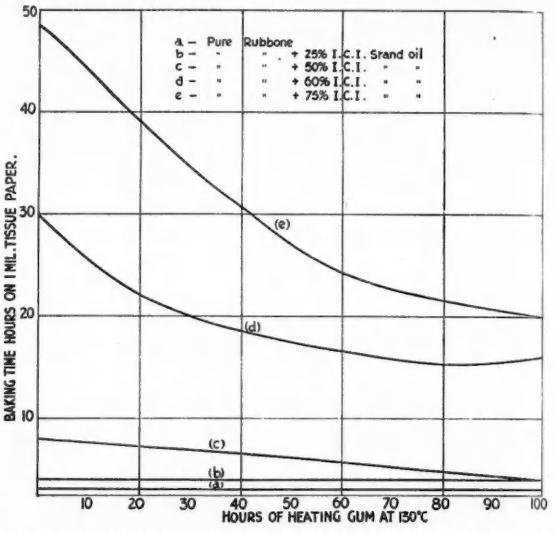
For comparing its efficacy as a substitute for oil-impregnated paper in the insulation of transformer windings and cables, 5-mil. cable paper was varnished with a mixture of 60/40 I.C.I. stand oil gelled "Rubbone." The breakdown voltages were 700 to 800 V per mil. when baked to 100 deg. C. and 600 to 700 V when baked at 230 deg. C.

Ten non-overlap layers, staggered, of treated and oil-impregnated papers were wound on a steel rod and heated in an oven at 100 deg. C. for twenty-four hours. The untreated paper broke down at 11.38 kV or 615 V per mil., and the treated paper at 11.50 kV or 605 V per mil.

Moulding powders prepared from "Rubbone" and wood flour showed generally poor mechanical strength and only average dielectric properties, but possessed excellent anti-tracking properties.

The "Rubbone" did not dry in the centre of treated coils, but manganese driers improved this condition without apparently affecting the breakdown voltage between turns, which varied between 1.4 and 1.8 kV.

These experiments appear to show that "Rubbone" possesses



Heating and baking periods of "Rubbone" with various added properties of stand oil

electrical properties and physical characteristics which make it worthy of further investigation, that when properly processed it has an important application in the manufacture of asbestos boards and tapes, and that it forms a basis for the easy manufacture of baking varnishes for application to paper and boards.

The Grand Coulee Project

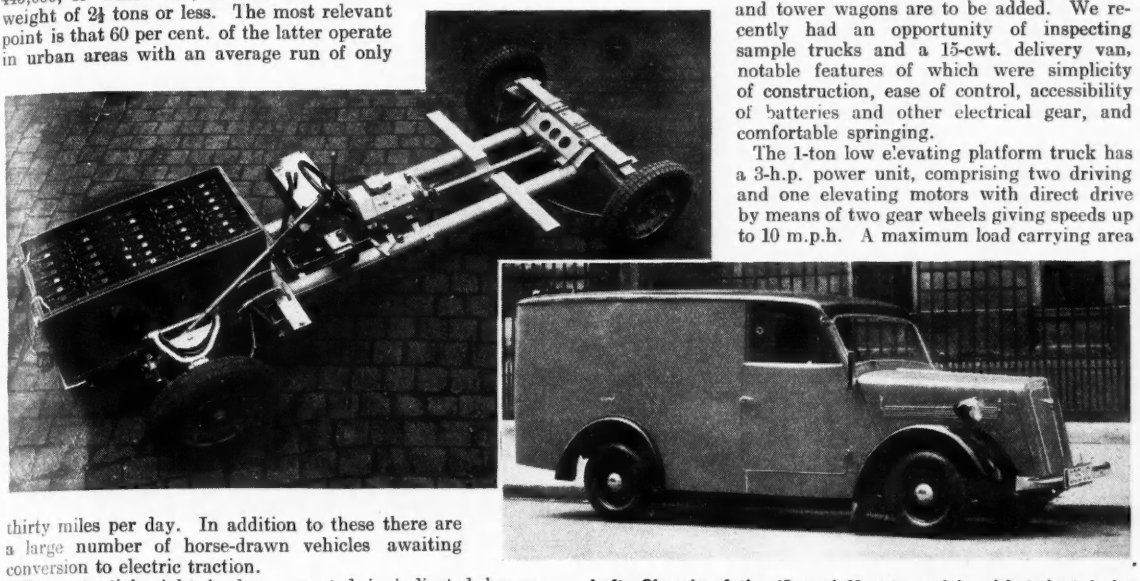
THE Grand Coulee project, one of the most extensive of its kind ever attempted, embraces the construction of a dam (which, it is said, will be the greatest in the world); power plant and pumping plant on the Columbia River; a reservoir in Grand Coulee; and main irrigation canals and water distribution system on the project lands. The estimated cost of the dam and power plant is £35,758,000; and of the irrigation system £39,568,000. The dam will be of the straight gravity type and will rise to a height of 550 ft., second only to Boulder Dam which is 727 ft. high. The thickness of the dam at the base will be about 500 ft. and at the top about 30ft., and the length along the crest approximately 4,200 ft.

According to *Electrical Engineering* (the official journal of the American Institute of Electrical Engineers) some 11,250,000 cu. yd. of masonry and 65,000,000 lb. of reinforcing steel will be required for the works. The reservoir created by the dam will cover an area of about 82,000 acres and will contain approximately 10,000,000 acre-feet of water. There will be two power houses, one at each end of the dam, each about 765 ft. long. Ultimately, eighteen generating units will be installed, each consisting of a 150,000 h.p. vertical turbine and a 120,000-kVA, 60-cycle, 13,800-V alternator. Water will reach the turbines through penstocks, each 18 ft. in diameter under an average head of 335 ft. The pumping plant, which eventually will comprise twelve pumps, each having a capacity of 1,600 cu. ft. per second and driven by a 65,000-h.p. motor, will be on the west bank of the river adjacent to the upstream side of the dam. The normal pumping head will be 295 ft., with a maximum of 367 ft. Water from this pumping plant will be used to irrigate about 1,200,000 acres of land on the east side of the Columbia River.

The entire project is being constructed by the United States Government under the direction of the Bureau of Reclamation of the Department of the Interior. It is anticipated that the dam and power plant will be completed in 1941. Three generators are to be installed initially, and these are expected to be in operation during 1942. Present plans provide for bringing in irrigation areas in small units only, at such times as there is a demand for additional land. According to estimates, the irrigation project will be finally completed at the end of about forty years.

Electric Vehicle Developments

THE field for battery vehicles in Great Britain may be gauged from statistics issued towards the end of last year by the Ministry of Transport. These give the total number of mechanically propelled vehicles as approximately 445,000, of which 330,000 had an unladen weight of 2½ tons or less. The most relevant point is that 60 per cent. of the latter operate in urban areas with an average run of only thirty miles per day. In addition to these there are a large number of horse-drawn vehicles awaiting conversion to electric traction.



Left: Chassis of the 15- and 20-cwt. models with twin tubular frame and independant suspension. Right: A 15-cwt. delivery van with a range of 50 miles, loaded

The potential night load represented is indicated by experience in Germany, where battery vehicles are as relatively advanced as trolley buses are in England. There over 160 million kWh per annum is taken for charging batteries. A desire to foster the use of home produced coal instead of imported petrol and fuel oil has prompted the German Government to encourage the development of the battery-driven vehicle and the Post Office in that country has more than 2,500 in daily service, compared with only two possessed by the G.P.O. The conditions would appear to be more favourable with us as door-to-door delivery of foodstuffs and other goods is comparatively non-existent in Germany.

Service Facilities Essential

Factors retarding progress in Great Britain are the additional cost of the vehicle due to the cost of the battery and charger and the lack of provision for the proper maintenance of the cells. A scheme has been evolved by Mr. E. C. Kny which is based upon the view that the battery should be regarded as fuel and not as an item of capital expenditure by the user.

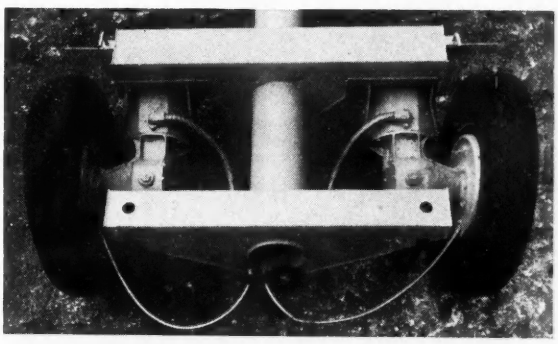
Under this arrangement the purchaser agrees to pay rent on an average of £150 per vehicle plus the cost of energy used, and is relieved of the responsibility of maintaining the battery, which would not be left to die on the car but would have a guaranteed maximum mileage irrespective of decreasing battery efficiency.

In the first instance operations are being confined to the larger towns and we are informed that supply undertakings have evinced a desire to co-operate in view of a possible night load which is estimated to be about 17 kWh per battery per day.

The need under this scheme to be able to change a battery quickly as well as to secure a low cost of chassis that lends itself readily to an assembly process of construction on a large scale has led Mr. Kny to acquire the rights and initiate arrangements for the manufacture in this country of vehicles and trucks of the Bleichert type.

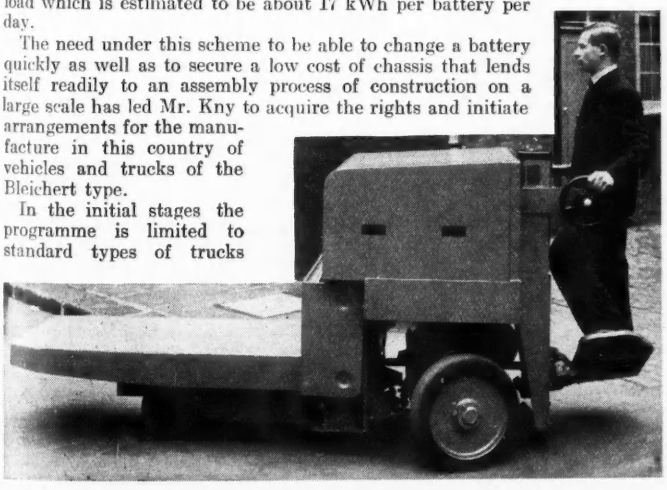
In the initial stages the programme is limited to standard types of trucks with fixed and elevating platforms for meeting industrial, railway and similar requirements, and twin-tubular welded chassis (without rivets) for 15-cwt. and 1-ton vehicles for the distributing trades, and a central tubular model of 1½ and 2 tons. Later low loaders, refuse collectors and tower wagons are to be added. We recently had an opportunity of inspecting sample trucks and a 15-cwt. delivery van, notable features of which were simplicity of construction, ease of control, accessibility of batteries and other electrical gear, and comfortable springing.

The 1-ton low elevating platform truck has a 3-h.p. power unit, comprising two driving and one elevating motors with direct drive by means of two gear wheels giving speeds up to 10 m.p.h. A maximum load carrying area of 16½ sq. ft. can be provided with a loading height of 11½ in. and a lift of 6 in. Steering is on the body-weight principle and control is by vertical hand-wheel incorporating a deadman handle. There are nine control positions. The 80-V lead-acid battery has a capacity up to 200 Ah. A ½-ton truck with a 40-V, 80-A battery is also included in the programme.



Twin motor arrangement for larger models

The equipment for the 15- and 22-cwt. chassis includes a 10-h.p. motor driving by steel gears up to speeds of 20 m.p.h. Lever control gives twelve positions (five forward, five reverse, one stop and charge and one pole-change switch) and the current clutch is foot-operated. The 80-V, 200-Ah battery, in a single trough unit, gives a range of 50 miles per charge. A 2-ton model with a two-motor (10-20 h.p.) chassis for a speed of 13 m.p.h., with two standard batteries will be available for heavier duties.



A 20-cwt. low-platform elevating truck

The Whitworth Society

The summer meeting of the Whitworth Society was held at Folkestone and Dover on July 21st and 22nd. The party assembled for an informal dinner at the Grand Hotel, Folkestone, on the evening of the 21st and the following morning proceeded to Dover by motor coach. The morning was occupied with a visit to the docks and ships of the new cross-channel ferries. The party was conducted by Mr. F. J. Wymer, the Southern Railway Marine Manager at Dover. The annual luncheon was held at the Lord Warden Hotel, and at this function the retiring president, Sir Henry Japp, inducted the new president, Mr. A. Havelock Case, to the chair. In the afternoon a visit was paid to the Dover Harbour works, the party embarking on the s.s. *Lady Savile*

Parliamentary News (BY OUR SPECIAL REPORTER)

Railway Electrification in Scotland

In the House of Commons on July 21st Sir T. Moore asked the Minister of Transport whether, following the success of railway electrification in the South of England, he proposed to take any steps to encourage its further extension to railway services in the more populous parts of Scotland in the near future.

Mr. Burgin said that the responsibility for initiating railway electrification schemes rested with the railway companies.

Electricity on Farms

Col. Ropner asked the Minister of Transport whether he was aware that fewer than 10 per cent. of the farms in this country had electricity supplies; and whether he would bear in mind the needs of the agricultural community in this respect when he was framing forthcoming legislation in connection with the electricity industry.

Captain Hudson said that the point raised would certainly be borne in mind in framing the forthcoming legislation.

Interference with Radio Reception

Col. Goodman asked the Postmaster-General what number of his engineering staff were employed in advising the public on questions of interference by electrical apparatus with radio sets; and what expenditure was incurred in this connection.

Sir W. Womersley, Assistant Postmaster-General, said that the number of full-time members of staff at present employed in assisting owners of wireless sets to obtain broadcast reception free from interference was about 250. The annual expenditure by the Post Office on this work was of the order of £90,000.

The Cost of Telephones

Sir G. Gibson asked the Postmaster-General whether the charges for installation of coloured telephone instruments could be reduced to a figure approximating to the charge for the black instrument.

Sir W. Womersley said that the charges for a coloured hand-microphone and a coloured bell set, whether attached to the instrument or not, were based on the average excess costs of these instruments over the costs of a standard black candlestick instrument and a black bell set. The charges covered the extra cost of maintenance and renewal as well as the additional manufacturing costs. He regretted that in view of the substantially greater cost of coloured instruments there was no prospect of the charge for them approximating to the charge for black instruments.

Scottish Power Delay

On July 22nd Mr. Mathers asked the Secretary of State for Scotland whether he was taking steps to make progress with the installation of electricity in housing schemes in the county of Linlithgow, where great delay was taking place on account of the dilatoriness of the Scottish Central Electric Power Co. and its associated company, the Scottish Midlands Electricity Supply, Ltd., in carrying out the instructions of the County Council.

Mr. Elliot said he understood that there had been some delay in connection with the provision of electricity for certain housing schemes in West Lothian but this had not retarded the erection of houses which were in some cases already occupied. He had communicated with the Minister of Transport who was causing inquiries to be made by the Electricity Commissioners.

Costs of a Change-over

On July 27th Mr. Hopkins asked the Minister of Transport if he was aware that the householders of the Cross Hands, Gorslas, Cefneithyn, and Cwmmaur districts were obliged to spend £653 on the change-over from the d.c. supply by the colliery company to the a.c. supply from the Llanelly and District Electric Co., and if he would set up an inquiry into all the circumstances of the change-over to the electricity company and call for a report.

Captain A. Hudson said he understood that the non-statutory undertaking of the colliery company was acquired by the authorised undertakers by agreement. The undertakers voluntarily assisted consumers in changing or adapting their apparatus free of cost for the changed supply, but they were not prepared to bear the cost of putting consumers' wiring in order in cases where this was necessary in the interests of safety. The undertakers submitted that they were under no legal liability to do so, and the matter was one which he had no power to decide.

Adjournment

The Prime Minister informed Mr. Attlee on July 22nd that it was hoped to adjourn the House to-day (Friday). It was proposed that the House should reassemble on October 21st when it would be prorogued and that the new session should commence on October 26th.

In the Courts

Supply for the Wirral Electrification

In the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Romer and MacKinnon, on July 21st, the case of the Attorney-General (at the relation of the Birkenhead Corporation) against the Liverpool Corporation and the L.M. & S. Railway Co. was heard on the appeal of the plaintiff from the dismissal by Mr. Justice Simonds in the Chancery Division of the motion asking for orders restraining the Liverpool Corporation from supplying to the railway company electricity for use in connection with its Wirral lines and restraining the railway company from taking that supply.

The question to be decided was where the railway company was to get its supply of electricity from for running trains on its Wirral lines. Subject to the result of the present proceedings the company had decided to take its supply from the Liverpool Corporation, which had to supply it at a point within the Liverpool area.

Sir Stafford Cripps, K.C., for the appellants, said the Wirral lines were wholly within the Birkenhead Corporation's area of supply. The Minister of Transport, after a public inquiry, had granted permission for the supply of electricity for the Wirral lines to be given by the Liverpool Corporation. The appellants' case was that that permission was a nullity because under the regulations governing the supply of electricity there was no power in the Minister to give the permission.

At the conclusion of the arguments of Counsel on July 22nd the Master of the Rolls in giving judgment, after reviewing the facts of the case and dealing with the points raised by the appellants on the statutes concerned on the question for decision, said he was of opinion that Mr. Justice Simonds had properly construed Section 47 of the Act of 1926 as applied to the facts of the case and that his decision was right and that the appeal failed and should be dismissed with costs. The Lord Justices concurred.

What is a Factory?

The question as to whether a mixing machine used in a cinema construction at Accrington brought the building under the Factory Act arose at Accrington Court on July 16th, when Normanton, Ltd., Manchester, were summoned for not complying with regulations in that the metal cap of a screw cap electric lamp was not efficiently protected to prevent danger, and as a result a person was injured.

An inspector said that the workman was found unconscious with the lamp still clasped in his hands. The workman said he accidentally knocked the lamp down and then tried to stop it. It "stuck" in his right hand and when he attempted to push it off it "stuck" to both hands. He fell down and did not remember anything more.

Mr. S. J. Emmerson, Electrical Inspector of Factories, said that the electricity regulations only applied if power machinery was used. The lampholder formed part of a current-carrying conductor. The tape with which it was wrapped was not put there as a protection, but to prevent the lamp being removed by unauthorised persons. There should have been a porcelain shroud for protection. The lamp was incomplete and there were other lamps in a similar condition.

Mr. Cunliffe, for the defence, said that there was no connection between the lamp which caused the accident and the machinery which the prosecution claimed made the building a factory. He submitted that the case failed on the ground that the mixing machinery was outside the building. Even if the Bench thought it was a factory, defendants were not the occupiers of this part of the building. The inspector replied that so long as machinery was available for use, as it was in this building, the premises constituted a factory. Messrs. Normanton were the only people using this machinery in construction work.

The Bench considered that the building was a factory within the meaning of the Act, and that Messrs. Normanton were the occupiers. The hearing was adjourned until September 8th for the defence to consider the legal position.

Action Against the E.T.U.

In the Chancery Division on Tuesday, July 27th, Mr. Justice Farwell commenced the hearing of an action brought by Messrs. H. V. L. Ross, P. H. Cliburn, F. Lester, J. J. Vaughan, F. S. Hallam, J. F. S. Hart and R. G. McLennan, against the Electrical Trades Union for an injunction to restrain the Union, its servants and agents, from (1) acting on a resolution dated February 14th, 1937, passed by the executive council whereby the plaintiffs were expelled from membership; (2) from treating the plaintiffs as having been expelled from the Union or having forfeited any money paid therein; (3) for a declaration that the decision was void and *ultra vires* the rules of the Union, and was contrary to natural justice; and (4) in the alternative that the decision had been revoked, rescinded or waived as against the plaintiffs The defence was a general denial of the plaintiffs' allegations.

Mr. Rewcastle, K.C., in opening the case, stated that the litigation arose out of the unofficial strikes which took place at the end of last year over the new Earls Court building and the plaintiffs and two others who had formed themselves into a body called the London Central Committee had been expelled from the Union because of their action in encouraging the strikes. He (Counsel) did not think his Lordship was in the present case concerned with the unofficial strikes in any way, the sole question being whether in the circumstances

the plaintiffs had been rightly or wrongly expelled from membership of the union. He contended that the most the plaintiffs could be exposed to was disciplinary action after a proper inquiry had been held as provided for in the rules.

Proceeding, Mr. Rewcastle said that the London Central Committee dealt with the affairs of the Union in the London district. One of the expelled members had taken no action and another had been readmitted to the Union. In reply to the Judge Mr. Rewcastle said that all he admitted was that the men might have, under the rules, been guilty of conduct which would justify an inquiry. The first thing the plaintiffs knew about the inquiry was that they were summoned on February 7th to meet the executive council and to answer wholly unspecified and undefined charges under a general rule of having been guilty of conduct prejudicial to the Union.

The men were entitled to have the charges which were made against them made to their faces. The tribunal had a quasi-judicial status and was bound by the rules and the procedure appertaining to such bodies.

Mr. Ross, one of the plaintiffs, gave evidence in support of counsel's opening statement. In cross-examination by Mr. Grant, he said he wished to remain a member of the Union. He admitted that it was part of his duties to obey the constitution of the Union and to uphold its interests. He thought that the men were right in going on strike, but agreed that under the rules of the Union they were wrong.

Messrs. Cliburn, Lester and Vaughan, three of the other plaintiffs, also gave evidence.

The case was proceeding as we went to press.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Gas Rings and Electric Cookers

The actual merits of the Egham and Staines case reported in your issue of July 23rd are not so important as the implication arising from the action that electric cookers are so slow in heating as to warrant the installation of gas rings in conjunction with them. This fallacy—because fallacy it is—is being spread amongst householders largely owing to lack of vision by the authorities controlling the installation of electric cookers.

The modern enclosed hotplate is a most efficient cooking medium, but its efficiency depends upon two dead flat surfaces coming together to make an "all-over" contact. Any supply authority installing an electric cooker and leaving it to chance whether the woman uses her old pots and pans must not be surprised if she wants to install a gas ring alongside her electric cooker, because inevitably she will complain that her cooker is slow under such circumstances. What other industry would take such a risk in developing sales?

Surely, in these days a woman has the right to expect that, when an electric cooker is being installed, she is getting the latest and best medium for cooking which, in fact, she is. Why, therefore, allow her to be disappointed because she finds it is slower than a gas cooker, when this can be prevented? There is no difficulty whatever in boiling three pints of water in 8 minutes on an enclosed hotplate, and a gas ring cannot do it quicker, but the public are being led to believe differently.

Even where cookers with open elements are being put on the market there is invariably also an enclosed hotplate. To say, therefore, that specially constructed utensils are not required is, in fact, wrong, and there is no escape from this. If the enclosed hotplate is being used at all on an electric cooker, then steps should be taken to ensure that its efficiency is not impaired by allowing a pan with a bulged or hollow bottom to be used. It is surely much better to acknowledge this fact rather than to hide it and take steps to make efficiency not only possible but certain. When this is done every electricity supply authority can then state that by using an electric cooker a woman will save both time and money and will have a beautifully clean medium for cooking.

Another stupid thing which is being done by a few electricity supply authorities is to send out a 10- or 12-gauge pan with the bottom made flat, because it is cheaper, when nothing can prevent these utensils from distorting in a few months' time. There is a reason for distortion, and nothing can prevent an ordinary pan distorting. Why, therefore, put back the clock once again by taking the trouble to send out utensils of the wrong type merely because they are cheap when in 3 to 4 months' time the consumers will find that they cannot get results from the electric cooker and the gas company will come along with a gas ring to help them?

T. N. VEITCH,
Director, Hague & McKenzie, Ltd.

Birmingham, *July 26th.*

Carrier Telephony

The article in your issue of July 9th under the above title is open to criticism on several points. Mr. Chakravarti's system suffers from the limitation of band width. It is a pity that he did not base his proposals on the recommendations of the C.C.I.F. in this respect, as one of the attractions of a well-designed carrier-telephone circuit is the better articulation and greater freedom from noise which can be obtained as compared with a physical circuit. Moreover, his channels, when not in use for telephony, are too narrow to use for 18-channel voice-frequency telegraphy.

From the information given regarding the operation of the demodulator the carrier on the line could be of amplitude just equal to that of any side-band frequency. Indeed, the author implies this. But in order to provide against "over-modulation" in the demodulator, on the usual reckoning, the carrier power should be four times as great, *i.e.*, +6 db. on the wanted side-band power.

At the modulator the same applies, but here the energy of one side-band is suppressed. Thus the carrier power applied to the modulator (assuming the latter perfect) must be at least +9 db. on the wanted side-band power.

Now, the carrier has (according to the author) to be attenuated 8 db. more than the wanted side-band, so that this will cover the energy in the suppressed unwanted side-band and leave the theoretical minimum of carrier to be supplied to the modulator at +14 db. on the wanted side-band power. Under the same conditions (ideal modulator) the theoretical minimum for a suppressed carrier system is +9 db. Any loss in the modulator will make the author's power ratio worse, but the ratio in the case of suppressed carrier is unaffected. The modulator loss will be appreciable if the author uses the modern dry-plate rectifier frequenyc-changer, which does not usually give efficient and stable operation if worked on small margins.

The author points to his partially transmitted carrier as an easy means of counteracting changes of attenuation of the line due to temperature. Herein lies a defect of his transmitted carrier system, in that the effect of the attenuation change is magnified by its operation on both carrier and side-band. In suppressed carrier systems the effect is minimised, as the demodulator is always working around the same point.

I cannot agree with Mr. Chakravarti regarding the possible phase distortion in suppressed carrier systems. If the unwanted side-band is sufficiently suppressed not to interfere materially with the audio frequency derived from any wanted side-band frequency, then it does not matter whether the demodulating carrier comes over the line or is supplied locally. They are different frequencies and can have no phase relationship.

Regarding the point (page 47, column 1) about the need for a pilot for frequency and/or amplitude control, this is not essential on modern equipment, given a modicum of maintenance. There are a number of main trunk cabinet-suppressed multi-channel systems working in this and other countries where no pilot of any sort is provided.

Finally, since the carrier repeaters in the proposed system are spaced at fifteen-mile intervals, in the 75-mile line there would be ten line-filter groups.

P. L. WESTELL.

Coventry, *July 20th.*

Electricity and Gravitation

In Mr. Verschoyle's letter published in your issue of July 2nd, he assumes that change of weight of his radiator implies a change in the value of the force of gravity, and that the mass of the radiator remains constant. According to the theory of relativity a body radiating energy loses mass, the mathematical expression being $C^2 = E_1/M$ .....(1) where C = velocity of light, E_1 = change of energy, and M = change of mass.

The quantum theory of radiation states that the amount of energy radiated is proportional to the frequency of radiation, *i.e.*, $E_2 = h.f$ .....(2) where h = Planck's constant and f = frequency of radiation.

By the law of conservation of energy, neglecting losses, the quantity of energy radiated is equal to the change of energy of the particle, *i.e.*, $E_2 = E_1$ .....(3)

$\therefore$ substituting (1) and (2) in (3) we get $hf = C^2M$ .....(4)

$\therefore M = hf/C^2$.

Since both h and C^2 are constants. $\therefore M \propto f$, *i.e.*, the loss of mass (lift) is directly proportional to frequency of radiation, which fact is borne out by the straight line characteristic of the graphs shown in the letter. This would account for the change of weight shown by the radiators without any alteration in the force of gravity.

JAMES CAMPBELL.

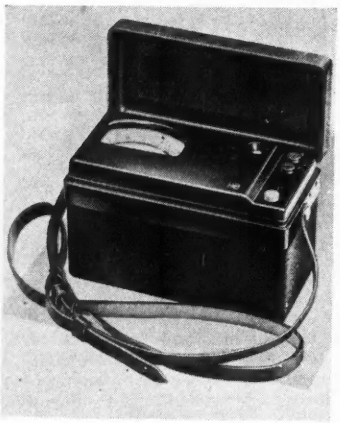
Glasgow, *July 27th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Push-button-operated Insulation Tester

The outstanding feature of the new insulation tester introduced by KANDEM ELECTRICAL, LTD., 769, Fulham Road, London, S.W.6, is that it discards the conventional hand-generator and instead is push-button operated. Only one hand is required to operate the instrument so that the other is free for manipulating the test leads, an arrangement which results in very quick circuit testing.



The " Isolavi " insulation tester

On pressing a button, a practically uniform d.c. voltage is produced by three ordinary and easily renewable pocket lamp batteries *via* a buzzer transformer, and a pointer indicates the insulation resistance without lag on a clearly marked scale normally graduated from 0-20 megohms.

It is claimed that fluctuation in voltage has no effect on the reading and a small neon lamp incorporated checks the voltage condition of the battery. This tester, which is known as the "Isolavi," is contained in a stoutly constructed black metal case fitted with a strong leather shoulder strap. Its measurements are 8 in. by 5 in. by 3¾ in., and it weighs about 4 lb.

Radio Receivers

The new season's range of radio receivers which has been introduced by the MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, London, W.1, includes a six-valve all-wave superhet auto-radiogram with five wave-bands from 7 to 2,225-m., and an undistorted output of about 3 W. Two other lower priced models, with three wavebands, but designed in general on the same lines have also been introduced. For the cabinet walnut is used in each case, and provision is made for the connection of an external loudspeaker having an impedance of about 6 ohms.

Copper Welding

The welding of non-ferrous metals has presented greater difficulties than those encountered in the fabrication of iron and steel. This is especially true of copper, which has a high co-efficient of expansion, rapid heat conductivity and oxidises quickly. Very slight variations in its quality and composition have had a considerable bearing upon the methods which have been applied in welding and until comparatively recently electric welding has often had a tendency to make the copper harder and brittle.

Welding the copper water jacket of a cylinder by the new Barimar " gas-flux " process

A new process is now being operated by BARIMAR, LTD., 14-18, Lamb's Conduit Street, London, W.C.1, for the welding of copper and alloys containing copper, the main feature of which is the employment of a " gas " flux. With most forms of welding, a flux in the form of paste, powder, or liquid is used to protect the hot or molten metal from oxygen in the air (nitrogen causes little trouble), and the use of gas as a flux in connection with non-ferrous meals is claimed to be an innovation. Ordinary fluxes become liquid during the process of welding, but with the new method, the gas is sufficiently dense to afford adequate protection to the metal without running the risk of any of the flux becoming incorporated in the weld, as happens with some kinds of flux.

The process, for the present, is being applied only to copper and certain alloys containing copper, but further developments are expected to make it suitable for welding other non-ferrous metals.

A.c. Motor Starting

A contactor switch for the direct-on starting of squirrel-cage motors up to 7½ h.p. at from 110 to 550 V is being introduced by MILNE & LONGBOTTOM, Elm Works, Mere Lane, Rochdale. It includes three indirectly heated thermal overload trips, which can be changed to suit the h.p. required, and a changeable no-volt coil.

Mechanical push-button operation is employed but remote control with separate electrical push-button stations can be arranged for. The fixing holes are inside the case and ample room has been left for the internal wiring.

The starter measures 6 in. by 8 in. by 4½ in. overall and weighs 10 lb.

The " Elm " contactor switch

Air Base Lighting Equipment

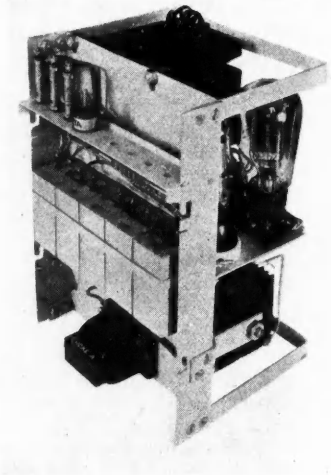
A new type of 6-kW six-lamp aerodrome landing floodlight enclosed in a glazed and moulded cylindrical housing has been developed and manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for the new Singapore Air Base.

The floodlight employs similar optical principles to the standard types but incorporates a new type of housing constructed of specially moulded " Urastone," an asbestos-like material. The complete equipment is approximately 9 ft. high by 7 ft. diameter inside. A special fan is incorporated owing to the climatic conditions which often prevail at this base.

A Stabiliser-rectifier for Traffic Control

The "Autoflex" stabiliser-rectifier unit for traffic control, which employs a valve in a special voltage stabilising circuit, has been introduced by the SIEMENS & GENERAL ELECTRIC RAILWAY SIGNAL CO., LTD. The automatic traffic controls are arranged either to give a constant pre-set time period to the traffic streams in both directions at a crossing, or, more usually, to cause the traffic to introduce its own control according to its incidence in either direction.

The important advance which is achieved in the "Autoflex" stabiliser-rectifier unit is the introduction of a type PX25 valve, which is connected in a patented circuit and is used to convert the a.c. input to d.c. output, thus being employed as a rectifier at the same time controlling the output variation to less than ±2 per cent., even though the a.c. input is followed by ±10 per cent. To achieve this the valve is employed as a half-wave rectifier with the grid connected to a network of resistances and condensers, and a neon tube. Utilisation is made of the striking and extinguishing voltages of the neon tube.



The " Autoflex " rectifier-stabiliser

The grid of the valve is made negative to a large degree by the striking of the neon tube, and by the network arrangement the rectified voltage is prevented from being raised above a predetermined critical value. The PX25 valve is chosen on account of its reliable performance and ability to operate continuously for long periods without attention. To achieve this service with complete reliability the high emission filament is operated at from one-tenth to one-fifth its rated anode current value.

Canadian Electrical Production and Trade

THE accompanying table, based on the Canadian official trade returns, shows the value of imports and exports of electrical goods during the past calendar year, with principal countries of origin and destination and notes of increases or decreases as compared with 1935.

The total value of imports, at $10,908,000, was $2,424,000 more than in 1935, and the share of the United States stood at $9,446,000, or $2,003,000 more than in the previous year. Imports from the United Kingdom were valued at $1,240,000, as against $916,000 in 1935 and $656,000 in 1934. These figures do not include vacuum cleaners, which are not grouped with electrical apparatus in the Canadian returns.

On the export side there was some slowing down if vacuum cleaners are taken into account, but excluding these the total value was $3,456,000, as against $2,734,000 in 1935 and $2,131,000 in 1934. Exports of vacuum cleaners totalled only $252,000, as compared with $635,000 in 1935. Other lines, however, showed healthy increases, notably to Empire and South American markets.

	1936 $(000).	Inc. or dec. on 1935 $(000).
IMPORTS.		
Batteries, primary—		
Total	139	+ 15
From United Kingdom	19	+ 9
„ United States	118	+ 5
Batteries, storage—		
Total	144	+ 8
From United Kingdom	86	+ 34
„ United States	56	− 28
Heating apparatus—*		
Total	93	+ 39
Dynamos and parts—		
Total	447	+ 199
From United Kingdom	137	+ 90
„ United States	296	+ 104
„ Germany	9	+ 3
Lamps, carbon filament—		
Total	19	—
From United States	10	− 5
„ Japan	9	+ 6
Lamps, metal filament—		
Total	215	+ 84
From United Kingdom	38	+ 37
„ United States	152	+ 47
„ Japan	22	− 1
Torches, flashlights, side and tail lights—		
Total	493	− 57
From United Kingdom	6	+ 1
„ Germany	4	− 6
„ United States	451	− 79
Lighting fixtures and appliances—		
Total	575	+ 367
From United Kingdom	10	− 1
„ United States	539	+ 366
„ Germany	7	+ 3
„ Japan	6	+ 3
Arrestors, choke coils, etc.—*		
Total	40	+ 7
Fuses, fuse plugs and cut-outs—*		
Total	97	+ 33
Electricity meters—		
Total	164	+ 53
From United Kingdom	43	+ 14
„ United States	117	+ 37
Motors for electric fans—*		
Total	46	+ 27
Motors and complete parts, unspecified—		
Total	1,497	+ 397
From United Kingdom	255	+ 45
„ United States	1,198	+ 330
„ Sweden	8	− 6
„ Switzerland	30	+ 28
Rheostats, controllers, etc.—		
Total	470	+ 128
From United Kingdom	23	− 9
„ United States	444	+ 140
„ Switzerland	2	− 4
Electric irons—*		
Total	39	+ 17
Sockets, outlets, etc.—		
Total	65	− 9
From United Kingdom	1	− 1
„ United States	62	− 10
Magnetos for i.c. engine mfrs. and parts—*		
Total	10	—
Sparking plugs, other magnetos, etc.—		
Total	97	− 198
From United Kingdom	2	− 4
„ United States	93	− 194
„ Switzerland	2	—
Switchgear, flameproof, for use underground in coal mines—		
Total	18	+ 3
From United Kingdom	18	+ 3
Switches, switchboards and circuit-breakers—		
Total	593	+ 59
From United Kingdom	57	+ 11
„ United States	522	+ 38
Telegraph apparatus—		
Total	78	+ 46
From United Kingdom	7	− 2
„ United States	71	+ 48
Telephone apparatus—		
Total	635	+ 184
From United Kingdom	49	− 29
„ United States	585	+ 213
Transformers and complete parts—		
Total	113	+ 21
From United Kingdom	18	− 7
„ United States	89	+ 23
Radio apparatus, unspecified—*		
Total	2,357	+ 662
Radio valves—		
Total	290	+ 32
From United Kingdom	25	+ 14
„ United States	264	+ 17
Turbo-generator sets, 700 h.p. and over, of a kind not made in Canada—		
Total	301	+ 114
From United Kingdom	251	+ 89
„ United States	49	+ 43
Electric dry-shaving machines—*		
Total	204	+ 130
Electrical apparatus not elsewhere specified—		
Total	1,762	+ 188
From United Kingdom	101	+ 34
„ United States	1,632	+ 145
„ Germany	2	—
„ Switzerland	19	+ 9
Total value of electrical apparatus, lamps and fixtures	10,908	+ 2,424
From United Kingdom	1,240	+ 324
„ United States	9,446	+ 2,003
Vacuum cleaners—		
Total	199	+ 130
From United Kingdom	127	+ 80
EXPORTS.		
Telegraph and telephone apparatus—		
Total	266	+ 48
To Brazil	151	+ 54
Batteries, storage—		
Total	140	− 31
To New Zealand	36	− 15
„ Argentina	22	− 14
Batteries, other—		
Total	106	− 69
To United Kingdom	16	+ 3
„ New Zealand	86	+ 22
Radio apparatus—		
Total	288	+ 143
To United Kingdom	156	+ 92
„ South Africa	22	+ 10
„ New Zealand	36	− 3
„ Brazil	41	+ 41
Dynamos, generators and motors—		
Total	316	+ 149
To United Kingdom	148	+ 43
„ Australia	57	+ 45
„ New Zealand	40	+ 11
„ Newfoundland	59	+ 59
Electric stoves and parts—		
Total	1,112	†
To South Africa	676	†
Elec. heating and cooking devices—		
Total	25	†
To British S. Africa	19	†
Sparking plugs, magnetos, etc.—		
Total	726	+ 202
To United Kingdom	391	+ 122
„ South Africa	67	+ 26
„ Australia	150	+ 46
„ New Zealand	47	+ 13
„ India	36	+ 2
Electrical apparatus not elsewhere specified—		
Total	477	+ 187
To United Kingdom	82	+ 69
„ Brazil	28	+ 8
„ Chile	14	+ 5
„ Mexico	75	+ 29
„ New Zealand	81	+ 41
Total value of electrical apparatus	3,456	+ 722
To United Kingdom	929	+ 317
„ United States	23	− 24
Vacuum cleaners—		
Total	252	− 383
To United Kingdom	144	− 403
„ Australia	17	+ 4
„ New Zealand	19	+ 9
„ Irish Free State	57	− 2

* Mainly from United States.
† Comparable figures not available for 1935.

Details of the output of Canada's electrical manufacturing industry are not available beyond 1935. In that year 182 separate plants were engaged in the production of electrical apparatus valued altogether at $61,153,000, an advance of 20 per cent. on 1934 and 65 per cent. on 1933. This total does not include porcelain insulators or electric washing machines, which represent an additional value of about $13,000,000.

Factory sales of generators in 1935 totalled $1,428,000 in value, as compared with $583,000 in 1934, and those of electric motors $3,592,000, as compared with $3,225,000. Three firms are listed as making generators and nine others as making motors. Factory sales of transformers fell off slightly between 1934 and 1935, but at $1,992,000 in value were still $1,900,000 more than the value of imports. The decline in local manufacture was shown chiefly in the larger capacities, *e.g.*, over 7,500 kVA and over 110,000 V.

Production of electric refrigerators in Canada totalled 27,067 units, valued at $3,444,550 in 1935, as compared with 30,257 units valued at $3,933,000 in 1934, and little more than half that number in 1933. There was an increase of 62 per cent. in factory sales of vacuum cleaners, reaching a value of $2,413,000. In the previous year these sales were valued at $1,430,000. The turnover in 1935 included 40,937 floor models at $1,570,000, 12,736 hand models at $162,000, parts at $566,900 and attachments at $114,100.

Electric ironers produced advanced from 7,415 units in 1934 to 9,465 units, and factory sales from 3,914 units operated by their own motors valued at $228,500 to 4,609 units valued at $272,000. Production of domestic washing machines increased from 84,079 in 1934 to 91,537 in 1935, the preponderant number being electrical, which in 1935 totalled 78,762. Factory sales rose from $3,831,000 in 1934 to $4,218,000 last year.

The manufacture of electric storage batteries was steadily maintained during 1936, after showing an increase in value from $2,991,000 in 1934 to $3,168,000 in 1935, when twenty-eight firms were engaged in this line of production. Dry cell batteries made in Canada also increased steadily between 1933 and 1935, from a value of $1,544,000 to $1,884,000.

During the past twelve or eighteen months substantial increases have been made in the manufacture of telephone equipment and wireless apparatus, including condensers. In 1935 the value of the output of radio apparatus and parts totalled nearly $11,000,000, more than twice the 1933 figure.

Lectures on Factory Law

The Industrial Welfare Society has arranged a course of three lectures to explain the far-reaching changes which will be brought about by the Factories Bill which is expected to pass into law this week. The lectures will be given by Mr. H. Samuels, barrister-at-law, at the headquarters of the Society, 14, Hobart Place, Westminster, S.W.1, from 6.30-7.45 p.m. on Thursdays, September 16th, 23rd and 30th, the fee for the course being £1 1s. (15s. in the case of member firms). The course will be repeated in Birmingham on October 7th, 14th and 21st.

The Building Centre

During the year ended May 31st, 1937, 68,776 persons visited the Building Centre, 158, New Bond St., London, W.1, 97,000 technical inquiries were dealt with, and 84,807 information sheets were issued to applicants on behalf of manufacturers. Progress is being made with the organising of the new Hospital Section which is to be situated in the two upper floors of the building.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

London Electricity Companies' Joint Working

The arrangement for joint working between the County of London Electric Supply Co., Ltd., and the City of London Electric Lighting Co., Ltd., as foreshadowed in the speeches of the respective chairmen of the companies at the annual meetings in March last, has now received the approval of the Electricity Commissioners. The County of London Electric Supply Co., Ltd., and its associates, the South Metropolitan Electric Light and Power Co., Ltd., and South London Electric Supply Corporation, Ltd., have for some years past been operated as one undertaking in respect of management and engineering matters. The arrangement is now being extended to include the City of London Electric Lighting Co., Ltd. Meetings of the County Co. on August 16th and the City Co. on September 3rd, are to be held to pass the necessary resolutions.

Employment During June

According to the *Ministry of Labour Gazette* employment in the engineering industry during June showed little change, was good on the whole, and very good in electrical engineering. The total number out of work in the engineering industry fell from 54,716 in May to 53,907 in June, and the percentage from 5.2 to 5.1 (7.4 in June, 1936). In the electrical engineering section the number unemployed was 3,045 (3,121 in May) or 3.0 per cent. (3.1 in May and 4.0 in June, 1936). The unemployed in the electric wiring and contracting industry numbered 3,935 or 10.3 per cent. (same in May, 11.9 in June, 1936), while in the cable, apparatus, lamps, &c., group the number decreased from 8,038 in May to 6,893, or from 5.3 to 4.5 per cent. (6.6 in June, 1936).

Need for More Demonstrators

Mrs. Pender-Chalmers, vice-chairman of the Electrical Association for Women, stressed the need for more and better trained demonstrators when she presented certificates to the students of the London School of Electrical Domestic Science at the Basil Hotel, Knightsbridge, last Friday. Without a sufficient staff of demonstrators, she said, electrical progress must be slow. They were the teachers of electricity, and to them fell the task of overcoming the public's fear of this new force in the home. Miss H. M. Minoprio, principal of the School, reported that out of 162 students received into the school nearly one hundred were already working as demonstrators and saleswomen.

Pension Scheme for Ferranti Employés

Ferranti, Ltd., has recently adopted a group pension scheme for its 600-700 permanent staff employés. The employés themselves contribute a weekly amount according to their salary, and the company pays for the balance of the benefits, which include pensions at sixty-five for males and at fifty-five for females, and a benefit in the event of death or total and permanent disablement whilst in the company's service. The scale of pensions is based on salary and years of service between entry into the scheme and retirement, and, in addition, a pension is provided in respect of past service. The pension is payable for the lifetime of the pensioner or to his dependants for the balance of five years should be die within this period after retirement. A special marriage dowry has been arranged for women employés. The company is not only paying for the balance of the pension in respect of service after the scheme starts, but for the whole of the past service pension and for the whole of the life assurance and total disablement benefits. The scheme was devised by Leslie & Godwin, Ltd., insurance brokers, and is secured by group policies issued by the Prudential Assurance Co.

Wages in the Cable-making Industry

The Ministry of Labour cost of living index figure for July 1st is 55 per cent. above the 1914 level, thus involving an increase of wages in the cable-making industry on the third pay-day in August, 1937. In both districts the increase for male timeworkers is about 2s. per week over the existing rates, while for youths under 21 the increase range from 6d. to 1s. 6d. The rates for female workers were revised in May; there are now to be increases of a further 6d. for those under 18, and 1s. for 18 and over.

New Showrooms and Offices

A tender of £250,000 for the erection of new central premises for the Bristol Electricity Department has been approved by the City Council.

The Croydon Corporation Electricity Committee recommends the erection of new central offices and showrooms costing £100,000 on the Braithwaite Hill and St. Agnes Home site.

The North-Eastern Electric Supply Co.'s new premises in Front Street, Bedlington, were recently opened by Mr. Robert Watson, chairman of the Bedlington Urban District Council. The premises consist of a main showroom, office accommodation for the administration staff, storerooms and a lecture theatre with seating accommodation for about thirty-six. Mr. W. F. T. Pinkney, the company's lighting and heating engineer, mentioned that the recent reduction in electricity charges represented a concession of £1,000 a year to Bedlington consumers.

Councillor T. J. Gooding, chairman of the Leicester City Transport Department, opened new offices at the Abbey Park Road depôt, Leicester, on July 22nd. The new building, which is the first municipal building in the city to have air-conditioning plant, supersedes the old offices in Humberstone Gate.

Cable Manufacture in Estonia

It is reported from Reval that negotiations are in progress for the establishment in Estonia of a factory for the manufacture of electric wires and cables.

The Empire Exhibition, Glasgow

A hope that England would co-operate fully in the Empire Exhibition which is to be held in Glasgow from May to October, 1938, was expressed by the Earl of Elgin and Kincardine, president of the Scottish Development Council, when opening the Council's Scottish information bureau at 457, Strand, London, W.C.2, last Friday. He said that the interest of Their Majesties, the King and Queen, had been assured as well as that of the Dominions and Colonies. The new Strand premises, which replace offices at British Industries House, are intended as a London show-window and inquiry bureau for the Scottish Development Council, the Scottish Travel Association, and the 1938 Empire Exhibition. Exhibitions of Scottish products will be held there from time to time.

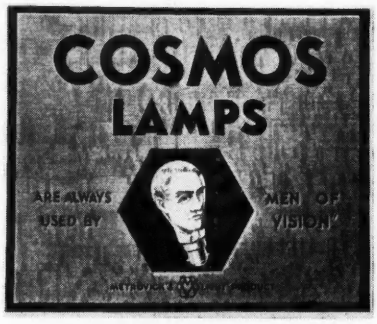
Electricity at Hanley Park Fête

Particular attention was directed to refrigerators in an interesting exhibit arranged by the Stoke-on-Trent Corporation Electricity Department at the recent Hanley Park fête. How electricity helps in cooking, water heating, vacuum cleaning, clothes washing and other domestic duties was also demonstrated in the well-organised display.

The Stoke-on-Trent Corporation Electricity Department's display at the Hanley Park fête at night

The "Cosmos" Lamp Campaign

Particulars of the "Cosmos" lamp campaign for the coming lighting season have arrived from the Metropolitan-Vickers Electrical Co., Ltd., earlier than usual this year. Based on last year's theme, the campaign continues and extends the benefit of previous publicity work and utilises again the slogan "Better Light — Better Sight." The main display piece shows the well-known moulded head of the "Man of Vision" in a frame setting of colour planes, giving the effect of depth; a flickering light is used on the head and the words "Cosmos lamps" appear in bright translucent letters. A smaller easily collapsible unit in attractive colours and a novel box sign are also available, as well as a full complement of showcards, folders, booklets, catalogues, pocket price lists, bakelite holders for overprinted envelopes, calendars and novelties.



A "Cosmos" lamp showcard

Irish Free State Electrical Imports

The half-yearly imports of electrical goods and machinery into the Irish Free State show a considerable increase in value as compared with the corresponding period in 1936. The largest advance occurs under the heading "Telephone and telegraph apparatus," the value of which amounted to over £50,000 as against only £5,554. Imports of electric lamps fell considerably, due mainly to the Government Orders restricting importation to protect the Irish lamp works. The following are details of the trade, showing the increases and decreases as compared with the first half of 1936:—

	January–June, 1937.	Inc. or dec.
	£	£
Electric motors	28,777	– 183
Electrical machinery, other sorts, not enumerated separately	117,420	+ 10,948
Complete dry batteries	7,251	+ 1,592
Dry battery parts	1,556	– 720
Electric lamp bulbs	11,974	– 17,775
Electric lighting accessories, fittings and parts	40,313	– 3,320
Electric wires and cables, insulated	47,661	+ 4,478
Telegraph and telephone apparatus, not enumerated separately	50,303	+ 44,749
Complete broadcast receivers	29,742	+ 7,749
Complete radio-gramophones	535	– 140
Other radio apparatus, fully or substantially assembled	4,556	+ 72
Radio components and accessories	40,483	+ 6,178
Other electrical goods and apparatus	159,241	+ 29,390
Total value...	£539,812	+ £83,018

Economic Conditions in Malaya

A recent report by Mr. A. Hartland, officer in charge of the Trade Commissioner's Office, Singapore, issued by the Department of Overseas Trade (H.M. Stationery Office, 1s. 1d. post free), dealing with economic conditions in Malaya, shows that during the last three years there has been a continued increase in the imports of electrical equipment. The figures for 1936 were given in our issue of June 11th (p. 895). The report mentions that an Ordinance to regulate the importation of lamps and electrical appliances was passed in November last year, mainly to safeguard the public against deceptively marked lamps and unsafe fittings.

French Electrical Imports and Exports

French imports and exports of electrical machinery, apparatus and cognate material during the first quarter of the current year as compared with the corresponding three months of 1936 are shown in the appended table. The values are given in thousands of francs, while for purposes of comparison the sterling values of the totals are converted at 125 francs to the £. It will be seen that both sections of the trade show an increase, imports having advanced to the extent of £336,416 or nearly 80 per cent., and the exports by £105,944 (about 20 per cent.).

	Imports. Jan.-March,		Exports. Jan.-March,	
	1936. 1,000 fr.	1937. 1,000 fr.	1936. 1,000 fr.	1937. 1,000 fr.
Dynamo-electric machines, transformers and parts	5,472	11,552	4,801	6,926
Telegraph, telephone and other electrical appliances.	28,097	47,688	17,978	19,329
Incandescent lamps and radio valves	8,850	21,351	3,873	5,306
Arc lamps and parts	46	44	—	11
Carbons for electric and industrial purposes	1,261	2,149	3,466	4,956
Electric wires and cables	1,606	2,073	6,008	9,587
Parts of electrical apparatus	3,765	4,838	2,825	4,446
Magnets, other than electro-magnets	81	180	—	—
Accumulators and parts	437	466	2,584	4,264
Dry batteries and condensers	2,855	4,016	502	676
Porcelain and other insulators	407	572	2,425	2,204
Total francs	52,877,000	94,929,000	44,462,000	57,705,000
Total at 125 fr. to £	£423,016	£759,432	£355,696	£461,640

Orders Recently Booked

A two-stage, double-acting air compressor manufactured by Broom & Wade, Ltd., has recently been installed at the boiler works of the John Thompson (Wolverhampton) Co., Ltd. It is one of a new series lately developed by the makers, and has a delivered capacity of 1,150 cu. ft. free air per minute at 100 lb. per sq. in. pressure, being driven by a 254-h.p. electric motor at 323 r.p.m. Other orders for this type of compressor have been received from the War Office; the Ministry of Marine, Athens; the General Electric Co., Ltd.; and the Sone Valley Portland Cement Co., Ltd., Calcutta. The company has also recently received a repeat order for four portable motor-driven sleeve-valve type compressor plants for New Zealand, and a number of orders for motor-driven single-stage compressors with automatic start and stop control and unloaders.

In connection with the enlargement of the L.N.E.R. station at York, the Westinghouse Brake and Signal Co., Ltd., has received an order for the installation of colour light signals. The new installation, which will be of the relay interlocking type, will, it is claimed, be the largest of its kind in the world. It will be controlled from one signal box, from which about 300 points will be operated; these will be worked by compressed air electrically controlled, except in the case of the more remote ones at the large double junctions at Chaloners Whin, where electric motors will be used.

The Trix Electrical Co., Ltd., has recently installed sound equipment at the Leeds Training College.

Edgar Allen & Co., Ltd., have received an order for a 10-ton electric furnace from the Electric Furnace Co., Ltd.

Battery Equipment on Atlantic Flight

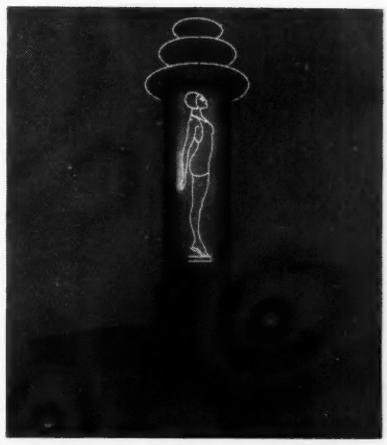
The Imperial Airways flying boat *Caledonia*, which is being used on the Atlantic experimental flights is equipped with "Nife" steel plate alkaline batteries for engine starting, landing lights and cabin lighting. These batteries consist of eighteen type "AMS5" cells, and are used in series for the 24-V radio, cabin lighting and landing light circuits. A tapping is taken off to each of the four 12-V electric starters for the "Bristol Pegasus" engines. The twenty-eight new Empire flying boats are also being equipped with "Nife" batteries for starting, as well as for lighting and radio.

Social Event

The London Electric Wire Co. and Smith's, Ltd., held their first annual sports day under ideal weather conditions on their Walthamstow sports ground on July 17th. Very keen interest was shown and there was a programme of forty-five events. The works manager and his wife were present and Mrs. Klein presented trophies and the prizes to the winners. The athletic events were followed by dancing, and in addition there were numerous side-shows.

A Novel Neon Installation

We have received particulars of a novel "Claudgen" neon sign which has been erected on a tower surmounting the entrance and pay-office of the Black Rock bathing pool, Brighton. The representation of a diving girl is carried out in 15-mm. red neon tubing, with 7-mm. high-intensity tubing, for the bathing cap and swimming costume portions of the design. The total height of the diving girl is 12 ft. Three rings of 20-mm. "Cleora" lime green fluorescent tubing are fitted round the top of the tower, the diameter of the largest ring being about 7 ft.



A "Claudgen" neon sign at the Black Rock bathing pool, Brighton

Manchester's New Police Buildings

Twenty-five miles of cables have been used for the new Manchester City Police headquarters in South Street, opened on July 16th. Modernity has been the keynote of the electrical installation, and dislocation due to failure of lighting supply is prevented by a "Keepalite" emergency installation supplying a duplex lighting system of one hundred points, which is adequate to furnish emergency lighting for at least ten hours. A battery of forty-eight slave clocks, controlled by a master and operated on the "Synchronome" impulse system is installed, and the complete clock service is operated by a triple-charged battery, by which the clock service could be continued for several days were the main supply interrupted. The building is heated on the forced circulation system, with an electrically operated centrifugal pump, and two large sec-

tional boilers, each fired by a thermostatically controlled mechanical stoker, form the basis of the system. For domestic purposes hot water is provided by a small sectional boiler fired by a mechanical stoker. At the Jackson's Row entrance an electric lift of the fully automatic push-button type, supplied by Etchells, Congdon & Muir, Ltd., accommodates seven persons and has a speed of 300 ft. per minute. In addition to the G.P.O. telephone installation, the switchboard for which can be transferred from its position at the top of the building to the basement in an emergency, a supplementary private installation of "Dictograph" house 'phones is also in use for the chief executive officers and their staff. Radio suppression devices have been provided for all electrical apparatus. The total cost of the building was over £100,000 and the complete electrical installation was carried out with Henley cables by H. C. Taylor & Co. The electric lighting fittings were supplied by Ascog, Ltd., and Best & Lloyd, Ltd. (bronze lamp standards). Provision is made for floodlighting the courtyard.

Nigerian Tariff Modifications

Under a new tariff schedule which came into effect in Nigeria on July 12th goods exempt from import duties include electrical apparatus, material and equipment; refrigerators and parts; telegraphic apparatus imported by the Eastern Telegraph Co.; and wireless apparatus.

Duty on Cycle Lighting Sets

The Import Duties Advisory Committee gives notice of an application for an increase in the import duties on dynamo lighting sets for cycles (other than motor cycles) and parts thereof. Any representations which interested parties may desire to make with regard to the applications should be addressed to the Secretary of the Committee, Shell-Mex House, Strand, W.C.2, not later than August 5th.

Change of Name

Electrical & Radio Research, Ltd., 3/9, Dane Street, High Holborn, W.C.1, has changed its name to Makers Agents, Ltd.

Trade Announcements

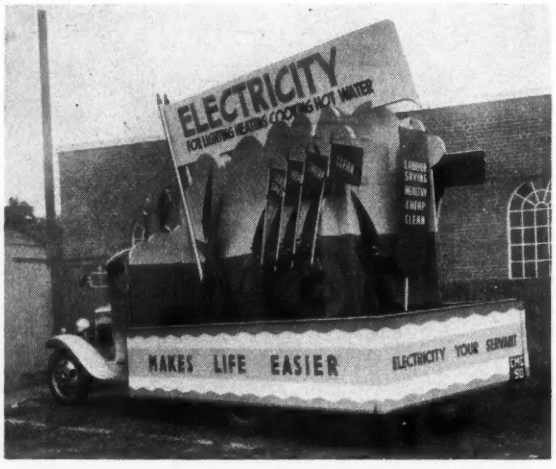
On August 3rd the Metropolitan-Vickers Electrical Co., Ltd., is opening a stores office at 78, Hanover Street, Edinburgh, (telephone: Edinburgh 27784; telegraphic address: Multiphase, Edinburgh). While intended primarily to deal with increasing business in "Cosmos" lamps, the new office will have selected stocks of small motors, meters and welding electrodes.

Frank Whitelegg, maker of special machinery for the wire, electrical and radio trades, has moved to larger premises at 34, York Road, King's Cross, London, N.1 (telephone Terminus 2494).

The Sun Electrical Co., Ltd., has opened a depôt at 39E, Bedford Avenue, Slough Trading Estate, Slough.

A Prize-winning Decorated Car

A tableau in which "I'm Electric" pointed out that electricity was "labour-saving, healthy, cheap and clean for



The E.D.A. decorated vehicle which won second prize in the Shirley Hospital carnival procession

lighting, heating, cooking and hot water," won a second prize for the E.D.A. decorated car which took part in the recent Shirley Hospital Carnival celebrations.

Japanese Lamps in Austria

The Austrian trade balance with Japan is largely in favour of the former country. In order to reduce it the Government has decided to permit the admission until June 30th, 1939, of a quota of 300,000 electric lamps and 3,000,000 small lamps (for torches, &c.). Hitherto the imports from Japan have consisted almost exclusively of small lamps.

For Sale

Richmond (Yorks) Corporation has for disposal two transformers and switchgear.

North Wales Power Co., Ltd., has for sale d.c. generating plant.

(See our classified advertisements.)

The Paris Exhibition to Reopen Next Year?

On account of the delay in the opening of the Paris Exhibition, the possibility of reopening it next year is being considered.

Increased Pay for Engineers

By a practically unanimous vote the executives of the engineering trade unions, representing about 500,000 members, agreed at a meeting held in London on Tuesday to accept a new wages agreement with employers. Under the terms of the new agreement, which is to come into force on August 23rd, the national bonus is to be increased by 3s. a week to all adult male workers—1s. 6d. as from the pay period commencing August 23rd and the balance as from the pay period commencing November 15th. The allowance for the first two hours of day shift overtime is to be increased from time and one-quarter to time and one-third, and an *ex gratia* allowance is to be credited in respect of holidays at the rate of one-fiftieth of the wages at full day rates for each full week's work performed. A joint committee is to be set up to explore the possibilities of the consolidation of the national bonuses.

The "Model Engineer" Exhibition

The annual exhibition of engineering models, tools and scientific equipment organised by the *Model Engineer*, is to be held at the Royal Horticultural Hall, Vincent Square, Westminster, from September 16th to 25th.

The New Bournemouth Baths

Referring to the article in our last issue describing these baths Bull Motors state that a number of their "super-silent" motors are installed in the building; one is to be seen in illustration No. 4 on page 109.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, ETC.	Price. July 28th.	Fortnight's Inc. or Dec.
a	Acid Oxalic ... ... per cwt.	50s.	—
a	Ammoniac, Sal ... ... per ton	£36	—
a	Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a	Borax ... ... ,,	£17	—
a	Copper, Sulphate ... ... ,,	£15 10s.	—
a	Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a	,, Perchlorate ... ... ,,	6d.	—
a	Shellac ... ... per cwt.	£4 18s.	—
a	Sulphur, Commercial ... ... per ton	£11	—
a	,, Roll .. .. ,,	£11	—
a	Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a	,, Crystals .. .. per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
	METALS, ETC.		
b	Aluminium, Ingots ... ... per ton	£100 to £105	—
b	,, Wire ... ... per lb.	1/1 to 1/9	—
b	,, Sheet and Foil .. ... ,,	1/3 to 2/9	—
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£244	—
	Grade II ... ... ,,	£169	—
	Grade III .. .. ,,	£90	—
c	Brass (rolled metal 2" to 12" basis)... per lb.	9⅝d.	—
c	,, Tubes (solid drawn) ... ... ,,	1/0¼ to 1/0¾	—
c	,, Wire, basis ... ... ,,	9¾d.	—
c	Copper Tubes (solid drawn) ... ,,	1/2¼d.	—
g	,, Bars (best selected)... ... per ton	£93	—
g	,, Sheet ... ... ,,		
g	,, Rod ... ... ,,		
d	,, (Electrolytic) Bars ... ... ,,	£64 10s.	10s. inc.
d	,, ,, Wire Rods ... ,,	£68 10s.	10s. inc.
d	,, ,, H.C. Wire ... per lb.	9⅛d.	⅛d. inc.
f	Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/9	—
f	,, Sheet ⅛" thick & up ... ,,	1/7 to 1/10	—
n	German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h	Gutta-percha, fine ... ... ,,	nom.	—
h	India-rubber, Para-fine ... ... ,,	10d.	—
i	Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s. 0d.	—
i	,, Wire galv. No. 1, P.O. Qual.... ,,	£23	—
g	Lead, English Pig ... ... ,,	£25 5s.	£1 10s. dec.
g	Mercury .. .. per bot.	£15 1s.	—
e	Mica (in original cases) small ... per lb.	10d. to 2/–	—
e	,, ,, ,, medium ... ,,	6/– to 12/6	—
e	,, ,, ,, large ... ,,	13/– to 17/6 up	—
p	Phosphor Bronze, plain castings ... ,,	1/3½	—
p	,, ,, drawn bars & rods ,,	1/3⅔	—
p	,, ,, rolled strip & sheet ,,	1/1¾	—
p	,, ,, wire ... ... ,,	1/3⅓	—
o	Platinum ... ... per oz.	£10 5s.	5s. inc.
d	Silicium Bronze Wire ... ... per lb.	11d.	⅛d. inc.
g	Spelter ... ... per ton	£22 8s. 9d.	7s. 6d. dec.
r	Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g	Tin, Block (English) ... ... per ton	£265	£1 10s. dec.
m	,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
m P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Annual Holidays

The English Electric Co., Ltd., announces the closing of its works as follows:—Bradford, from Friday evening, July 23rd, to Tuesday, August 3rd; Stafford and Rugby, from Friday evening, July 30th, to Monday, August 9th; and Preston, from Friday evening, August 6th, to Monday, August 16th. During these periods goods of a specially urgent character only will be despatched or received.

J. H. Tucker & Co., Ltd., are closing their works from Friday evening, July 30th, until Monday, August 9th. A skeleton staff will be in attendance at head office from Wednesday, August 4th, and district showrooms from Tuesday, August 3rd, to deal with correspondence only.

Reavell & Co.'s Ranelagh Works, Ipswich, will be closed from midday Saturday, July 31st, until Monday, August 9th.

Belling & Co., Ltd., inform us that their works will be closed from July 31st to August 9th.

The works of the Standard Fuse Co. will be closed from August 2nd to 7th inclusive, employés receiving full pay.

Bull Motors are closing their works during the whole of Bank Holiday week. The offices will be open and correspondence dealt with as usual.

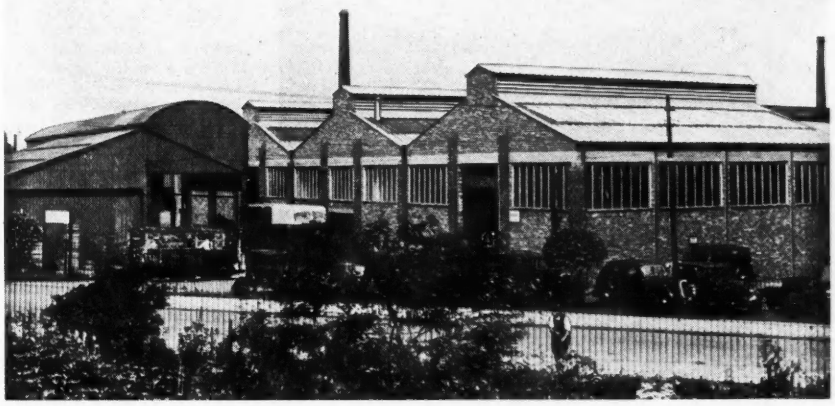
S. O. Bowker, Ltd., are shutting their factory from Friday evening, July 30th, until Monday, August 9th.

Battery Factory Extensions

The Chloride Electrical Storage Co., Ltd., has completed extensions to its works at Clifton Junction, made necessary by the bigger volume of business now being handled. The new shops will add greatly to productive efficiency and also provide increased covered storage space.

F.B.I. Business Forecast

According to the Business Forecast for the third quarter of 1937 published in the Federation of British Industries' *Business Barometer*, the break in the security markets during the past quarter is likely, in retrospect, to be found to have indicated a cyclical culmination. The level of activity in trade and industry, however, should continue to be well maintained. New factory construction and the State slum-clearance and overcrowding schemes are helping to sustain the building industry, while the peak pressure of the rearmament programme has not yet been reached. Export trade also should continue to show improvement, despite the difficulties caused by local shortages of certain materials.



The new extension of the Chloride Electrical Storage Co.'s factory at Clifton Junction

New Catalogues and Lists

Gordon Equipments, Ltd., 25, Milton Street, London, E.C.2.—Leaflets describing battery chargers and charging stands.

British Insulated Cables, Ltd., Prescot.—"Pernax" insulating material and copper and aluminium sheets are dealt with in two new booklets.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—A catalogue of heavy oil engines rated at from 10 to 100 b.h.p.

Power Contracts (Batwin), Ltd., 138, Southwark Street, London, S.E.1.—A leaflet describing the "Batwin" battery tester.

P. & B. Engineering Co., Ltd., Tamworth Lane Works, Mitcham.—Details of a new maximum demand indicator.

Brook Motors, Ltd., Empress Works, Huddersfield.—A catalogue of fractional h.p. motors and a booklet dealing with their construction.

W. Edwards & Co., Vaughan Road, Loughboro' Junction, S.E.5.—A catalogue of vacuum pipe line installations.

B.E.N. Patents, Ltd., Gorst Road, Park Royal, N.W.10.—An article on choosing spraying equipment is contained in the July issue of the "B.E.N. Bulletin."

Bankruptcy Proceedings

J. R. Brightwell electrical contractor, 107, Queen's Road, W.2.—This debtor's application for discharge was heard before Mr. Registrar Kean on July 21st at the London Bankruptcy Court. The Official Receiver stated that the receiving order was made on April 10th last, and the debtor failed with liabilities of £1,242, against assets of £520. Owing to heavy preferential claims it was doubtful if any dividend would be paid to unsecured creditors. The Official Receiver opposed the discharge on the grounds that the debtor had failed to keep a full set of books, that he had continued to trade knowing himself to be insolvent and had failed satisfactorily to account for loss of assets and that he had contributed to his bankruptcy by culpable neglect of his business affairs. His Honour upheld the report of the Official Receiver and suspended the discharge for eighteen months.

S. W. Bridges, wholesale radio and electrical dealer, lately trading as British & American Radio Service Co., 10/11, Field Place, St. John Street, E.C., and 219, Pentonville Road, N.—The public examination was held on July 21st at the London Bankruptcy Court before Mr. Registrar Kean, the accounts showing liabilities of £466 against assets of £77. The debtor stated that he started business in July, 1935, with a capital of £70. The trading was unsuccessful and he had to borrow money to continue. In May last the landlord distrained for rent and he ceased to trade. After a creditor had levied execution at his private residence he filed his petition. The debtor attributed his failure to bad trade, lack of capital, and heavy overhead expenses. The examination was concluded.

E. A. V. Burton, electrical engineer, 14, St. Peter's Park Road, Broadstairs.—Receiving order made July 16th on debtor's own petition. First meeting July 31st at the Official Receiver's office, 1, The Parade, Canterbury. Public examination September 14th at the Guildhall, Canterbury.

H. Jeffree, radio dealer, 72 and 76, High Street, Thornton Heath, Surrey.—Receiving order made July 12th on a creditor's petition. (Amended notice, not June 12th as stated in last week's issue, page 125.) First meeting August 4th at 29, Russell Square, London, W.C.1. Public examination September 23rd at the County Court, Scarbrook Road, Croydon.

F. V. Howitt, electrical engineer, carrying on business as The Falksley Co., Riste's Place, Barker Gate, Nottingham.—Supplemental dividend of 7d. in the £, payable August 5th at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham.

W. Smith and **A. G. Smith,** electrical and radio engineers, trading as W. Smith & Son, 23, Crescent Street, Weymouth.—Mr. H. T. Jones, Official Receiver and trustee, 12, Rolleston Street, Salisbury, announces that there is a surplus estimated at £137 on the separate estate of W. Smith, which it is proposed, there being no separate creditors, to transfer to the joint estate.

E. B. Page, electrical engineer, 10 and 12, John Street, Hyde, Cheshire.—Trustee, Mr. P. M. Milward, Official Receiver, Byrom Street, Manchester, released July 9th.

J. Davies, wireless engineer and dealer, 6, Howe Terrace, Crook, recently carrying on business at 8, Hope Street, Crook.—Trustee, Mr. W. A. Ellis, Official Receiver, 32, Frederick Street, Sunderland, released July 14th.

P. T. Bradley, radio engineer, 1, The Arcade, and 10, Church Lane, Stafford.—First and final dividend of 1s. 6d. in the £, payable August 6th at 17, Albion Street, Hanley, Stoke-on-Trent.

L. C. Wright, radio dealer, "Dalton," Beechley Road, Wrexham, recently carrying on business at Chester Street, Mold.—Receiving order made July 23rd on a creditor's petition.

A. W. Hovell, wireless dealer, 22, High Street, Beckenham.—First and final dividend of 1s. 8d. in the £, payable August 12th at 64, Gresham Street, London, E.C.2.

Company Liquidations

Ordsall Supply Co., Ltd., radio engineers, Manchester.—The creditors met recently at Houldsworth Hall Buildings, 90, Deansgate, Manchester. The statement of affairs showed ranking liabilities of £2,304, comprising trade creditors £2,019, cash claims £281, and bankers £4. In addition there were fully secured creditors for £1,244. After allowing £47 for preferential claims the net assets were £912, leaving a deficiency, as regarded the creditors, of £1,393. The issued capital was £700 and the deficiency so far as the shareholders were concerned was £2,092. The creditors decided to confirm the voluntary liquidation of the company, with Mr. H. S. Grant, accountant, Salford, as liquidator, with a committee.

King, Stringer & Co., Ltd., electrical, mechanical and general engineers, Ackway Works, The Hyde, Hendon, N.W.9.—Creditors and shareholders met on July 23rd at the offices of the Board of Trade, Carey Street, W.C.2, under a winding-up order made on June 28th. The statement of affairs showed gross liabilities of £14,890 and net assets of £510. The failure was attributed to lack of capital and other causes but the Official Receiver expressed the opinion that there was no justification for continuing trading once the directors were satisfied that the principal object (the marketing of an anti-theft device for cars) had failed. Mr. Hugh Fraser, London, was appointed liquidator.

Felgate Radio Co., Ltd.—Claims by August 3rd to the liquidator, Mr. B. F. Hallett, Staple House, 51-2, Chancery Lane, W.C.2. Meeting at Staple House on September 7th to hear an account of the winding up by the liquidator.

Provincial Tramways Co., Ltd.—Meeting August 24th at 1, Queen Victoria Street, London, E.C.4, to hear an account of the winding up by the liquidator, Mr. E. J. G. Webb.

Brocco Supply Co., Ltd., 49, and 51, Edward Street, Sheffield.—Liquidator, Mr. E. M. D. Jones, 28-30, Lime Street, London, E.C.3, appointed June 24th, with a committee of inspection.

Light-o-day Electric Lamp Co. (1927), Ltd., 283, High Holborn, London, W.C.1.—Liquidator, Mr. A. Garner-Stevens, 6, Broad Street Place, E.C.2, released March 18th.

Meeting of Creditors

Wiring, Ltd.—Meeting of creditors to-day (Friday) at the offices of Corfield & Cripwell, Balfour House, Finsbury Pavement, London, E.C.2.

Electricity Supply

Lighting, Domestic, Power

Addington.—MAINS EXTENSIONS.—The County of London Electric Co., Ltd., is to extend mains to the New British Gardens Estate at a cost of £949.

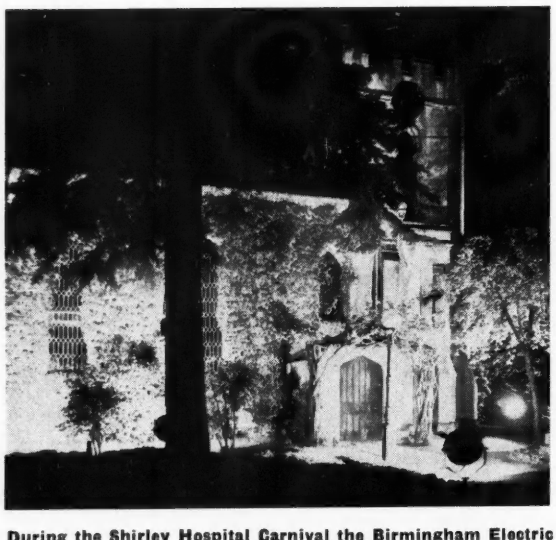
STREET LIGHTING.—Central lighting is to be installed at Addington Village at an estimated cost of £2,200 by the Croydon Corporation.

Alton.—LIGHTING AT BEECH.—Electric lighting is to be installed at Beech.

Argentina.—ELECTRIC POWER PRODUCTION.—According to preliminary statistics relating to the Industrial Census of 1935, there were on October 31st, 1935, 898 electric power stations in operation with a total installed motive power of 1,577,881 h.p. Personnel employed numbered 8,596.

Banstead.—ELECTRICITY INSTALLATION.—The L.C.C. is to install electric lighting, &c., and an electric fire-alarm system at Banstead residential school at a cost of £6,600.

Bedford.—LOANS.—Sanction is being sought by the Electricity Committee to loans of £15,000 for mains and services and £5,000 for consumers' wiring installations.



During the Shirley Hospital Carnival the Birmingham Electric Supply Department carried out floodlighting. Here is the Parish Church attractively illuminated

ELECTRIC COOKERS INSTALLED.—Electric cookers are to be installed by Marston-Ridgmont Properties, Ltd., in 200 houses on its Marston estate.

SUB-STATION.—The Electricity Committee is to erect a sub-station on the Belle Vue estate, Kempston, at a cost of £410.

Bingley.—CHEAPER ELECTRICITY.—The Electricity Committee has introduced a reduction in the rateable value tariff from 3s. to 2s. 6d. in the £ up to £25 rateable value, with the "unit" charge lowered from ½d. to ⅜d.; also a reduction from ¾d. to ½d. per kWh for shops, combined shops and houses and public houses on the installed m.d. system.

Bridport.—EXTENSIONS.—The Town Council is to apply for sanction to loans up to £12,000 for works in connection with extensions of its supply area to Powerstock, West Milton, Pymore, Salway Ash, Dottery and Stoke Abbott.

Bulgaria.—ELECTRICITY OUTPUT.—According to a recent D.O.T. report dealing with economic conditions, the output of electricity increased from 140,000,000 kWh in 1935 to 168,000,000 kWh in 1936 (19½ per cent.).

ELECTRIFICATION.—The electrification of the Stara Zagora region has been undertaken by the Pernik Mines, which propose to erect a power station near the State-owned Maritza coal mine. The State is also interested as a guarantor for working debts in the Vutcha water power scheme, designed for the electrification of the Plovdiv region and at present believed to be working at a loss.

Coventry.—MAINS EQUIPMENT.—Sanction is being sought to borrow £100,000 for mains and sub-station equipment.

Ealing.—ELECTRICITY IN SCHOOLS.—In order to encourage the use of electrical apparatus in schools, electric cookers, water heaters and kettles are to be installed and lent free of charge to Council schools.

KETTLES ON HIRE.—The Electricity Comittee is to reduce the charge for the hire of kettles to consumers having their own electric cookers to 1s. per quarter.

France.—OVERHEAD LINE 9,000 FT. ABOVE SEA LEVEL.—The 150,000-V line which has recently been erected in France to connect the Maurienne and Durance Valleys is claimed to be the highest of its kind in Europe. It passes over the Galibier Mountain, which rises to a height of 9,052 ft. above sea level. The line, which serves to connect the power station at Bissorte with an aluminium factory at Argentière, is made of an aluminium-steel alloy and has a section of 293 sq. mm.

Home Counties.—CHEAPER ELECTRICITY.—The Metropolitan Electric Supply Co., Ltd., announces that a reduction has been made in the charges for electricity, to take effect after the June quarter meter readings. To the consumers in the "Metesco" area the secondary charge on the two-part tariff is to be reduced to ½d. per kWh. This applies to Mid-London, Paddington, Acton, Greenford Detached, Hanwell and Southall. A reduced running charge of ½d. per kWh is to apply in the areas of the subsidiary companies—Brentford Electric Supply Co., Ltd.; Uxbridge and District Electric Supply Co., Ltd.; Egham and Staines Electricity Co., Ltd.; Windsor Electrical Installation Co., Ltd.; Slough and Datchet Electric Supply Co., Ltd.; and the Chesham Electric Light and Power Co., Ltd.

Harwich.—CHEAPER ELECTRICITY.—We are informed by Mr. J. H. Shepherd, the borough electrical engineer, that the price of electricity has been reduced as follows: Lighting, maximum charge now 5d. instead of 5½d. per kWh; two-part tariff, running charge ½d. per kWh (instead of ¾d.); fixed charge for business premises, £10 10s. (£12) per kWh; water heating ½d. per kWh all year (¾d. in winter).

Hungary.—ELECTRICITY SUPPLY PROGRESS.—In a recent issue of *Elektrotechnika* Herr P. Kuzaila states that during 1935 nearly 550 miles of new transmission lines were erected, of which 41.4 per cent. were high voltage. Three-phase 30-cycle a.c. is becoming more generally adopted in that country, 95 per cent. of all lines now being erected on this system. At the end of the year mentioned there were 14,138 miles of such lines in operation. Despite this the author states that there are still about 2,500 communes in Hungary in which no electricity supply is available.

Irish Free State.—THE INDUSTRIAL LOAD.—Interesting data regarding the employment of electric power in Irish Free State industries is furnished by the Census of Industrial Production, 1936, published in the current issue of the *Irish Trade Journal*, the official Government organ. In the distilling industry 7 electric generators (total capacity of 312 kW) and 108 electric motors (total capacity 1,300 h.p.) were in use at the end of 1936. The aerated and mineral water industry used a total of 8 generators (54 kW) and 169 electric motors (447 h.p.); the linen, cotton, jute and canvas industries, 38 generators (1,131 kW) and 365 motors (1,704 h.p.); the shirt-making industry, 7 generators (154 kW) and 115 motors (379 h.p.); the boot and shoe industry (wholesale factories), 6 generators (132 kW) and 660 motors (2,294 h.p.); the hosiery industry, 9 generators (134 kW) and 290 motors (1,186 h.p.); the soap and candle industry, 1 generator (10 kW) and 116 motors (730 h.p.); and the tobacco industry, 2 generators (300 kW) and 250 motors (1,187 h.p.). According to the official returns, 25 electric power companies, with a total nominal capital of £124,500, were registered at the end of 1936.

Jarrow-on-Tyne.—UNDERGROUND EXTENSIONS.—The Town Council has approved a proposal by the North-Eastern Electric Supply Co., Ltd., to lay underground cables in Salem Street from Beaumont Terrace over private ground to the Jarrow Tube Works and along Blackett Street to the boiler shops.

Liverpool.—SODIUM LIGHTING INSTALLATION.—An interesting lighting scheme has recently been completed in Bold Street under the direction of Mr. P. J. Robinson, city lighting engineer. The existing Revo "Killdark" lighting units have been converted to accommodate a 90-W "Philora" sodium and three 100-W gas-filled lamps in each unit, the latter serving to correct the colour value of the sodium lamp. The sixteen units installed are centrally suspended on span wires, 27 ft. high at intervals of 30 yd., over the 25-ft. wide carriageway. Tests show a minimum light intensity of 0.3225 and maximum intensity of 1.3825, with a diversity factor of 1 in 4.28.

London.—BATTERSEA.—The Borough Council has arranged for the provision of sixty electricity services at a cost of £434. An additional feeder is to be provided from Nine Elms sub-station to the premises of the Projectile Co.'s sub-station at a cost of £2,903, and additional switchgear at the sub-stations at a cost of £1,234.

ISLINGTON.—The scheme for the extension of mains at an estimated cost of £16,000, approved by the Council in December, 1935, has been completed, and almost all the roads in the borough now have a main on at least one side. For the purpose of facilitating the supply of electricity a number of the roads have mains laid on both sides, and, so that this number can be increased, a further scheme for the extension of mains at an estimated cost of £20,000 is proposed by the Electricity Committee. Approval has been given by the Electricity Committee to an estimate of £4,600 to cover the expenditure which will be incurred during the period ending September 30th, 1938, in the purchase of domestic electrical apparatus for sale and hire purchase, together with an estimate of £11,850 for the purchase of apparatus for hire. Instruments and meter-testing equipment are to be provided at a cost of £800.

ST. PANCRAS.—The Electricity Committee is to improve the lighting in Tottenham Court Road at a cost of £2,426, and experimental electric-discharge lighting is to be carried out by the B.T.H. Co. in Kentish Town Road. Arrangements are being made for the holding of two electrical exhibitions to

encourage the use of electricity for domestic purposes. It is proposed that one should take place in October and one in January, each lasting three days.

HACKNEY.—The Electricity Committee is seeking sanction to borrow £50,000 for domestic apparatus.

HAMMERSMITH.—The Electricity Committee is to provide supply to the Air Ministry depôt at the White City at a cost of £625.

POPLAR.—The Electricity Committee has obtained sanction to borrow £1,477 for mains and £44,905 for plant and connecting cables. A rectifier is to be installed on the premises of Cooper & Co., Ltd., Northumberland Wharf, Blackwall, at a cost of £309.

WESTMINSTER.—The Westminster Electric Supply Corporation, Ltd., has introduced a new tariff for tenants in City Council houses by installing a new domestic prepayment meter to enable consumers to use small appliances from the lighting circuit and as an alternative to the flat-rate charge of 6d. per kWh when the lighting installation does not exceed five points. Where the new meter is supplied the charge for the first two kWh is 6d. for all in addition 1d. per kWh. An experiment is to be carried out by the Highways Committee in conjunction with the Westminster Electric Supply Corporation, Ltd., with different forms of lighting in Tachbrook Street.

ELECTRIC LIFTS.—The Metropolitan Water Board is to provide two new electrically driven lifts to replace the existing lifts at the fittings testing shop, Hardwick Street, at a cost of £1,100.

The London County Council has decided to install a bed lift at St. Peter's Hospital, Whitechapel, at a cost of £4,630.

Middlesex.—ELECTRICITY IN SCHOOLS.—The County Council Education Committee is to install power circuits and a new system of lighting at St. Christopher's School, Hayes, at an estimated cost of £312.

Mortlake.—PROPOSED CREMATORIUM.—The Mortlake Crematorium Board is considering the installation of electric furnaces in the new crematorium.

North Westmorland.—OVERHEAD LINES.—The Rural Council has approved plans by the Westmorland Electric Supply Co., Ltd., for an overhead cable to be erected along the eastern shore of Lake Ullswater and under the lake to the Gerenside Lead Mines.

Norway.—HYDRO-ELECTRIC PROJECT.—Negotiations have been begun with a view to the establishment of hydro-electric works on the Pasvik River falls, on the frontier between Norway and Finland. The Finnish Nickel Co. is behind the scheme, and it is estimated that the capacity will be between 7,000 and 8,000 kW.

Penarth (Glam).—CARDIFF ACQUIRES UNDERTAKING.—As the result of negotiations commenced twelve months ago an agreement was reached last Friday in regard to the terms on which the Penarth electricity undertaking is to be acquired by the Cardiff Corporation. It is announced that, subject to the approval of the Electricity Commissioners, the price to be paid by the Cardiff undertaking is approximately £100,000. Three bodies are concerned in the transfer, the Cardiff Corporation, the Penarth Urban District Council and the Penarth Electric Lighting Co., Ltd., the actual owners of the station. The agreement specifies that the Cardiff Electricity Department shall be regarded as having taken control of the Penarth undertaking from January 1st, 1937, and that it is responsible for the town's electricity supply from that date, bearing any loss on the working until the actual merger takes place and, on the other hand, taking the benefit of any profits. At the present time Penarth consumers have to pay nearly double the charges paid by Cardiff consumers, but it is estimated that within six months of the completion of the proposed transfer the charges made at Penarth will be reduced. Originally it was intended that the Penarth Lighting Co. should be taken over by the local council, the merger with Cardiff being the suggestion of the Electricity Commissioners.

Port Talbot. — DEVELOPMENT SCHEME.—The Council has embarked on a two-years' scheme of electrical development costing at least £132,000. The scheme is divided into two main parts, the first being commenced last week with the acceptance by the Council of tenders and estimates for taking a bulk supply of current from the C.E.B. at the Victoria Road Works. This initial section embraces the construction of extra-high-voltage mains, the erection of two sub-stations, and the provision of low-voltage cables throughout three of the chief districts under the Council's jurisdiction. It also involves a capital expenditure of £90,983, including £15,985 for consumers' assisted electricity installations.

Rainford.—ELECTRIC COOKERS.—The Council has adopted a scheme submitted by the St. Helens Corporation for the installation of electric cookers and wash-boilers in fifty new Council houses. The scheme provides for the free installation and wiring to the meter, current being supplied from one meter at a charge of 1¼d. per kWh (minimum 1s. 6d. per week). There will be no charges for hire of equipment, free maintenance service will be provided by the Corporation, and the cooker and boiler will be removed in the event of the tenant not desiring them.

Salford.—SUB-STATIONS.—The Electricity Committee is seeking sanction to borrow £15,000 for sub-stations on consumers' premises, &c.

Shipley.—CHEAPER ELECTRICITY.—The Urban District Council has reduced its electricity tariffs for lighting from 5d. to 4½d. per kWh and for power from 1¾d. to 1½d. per kWh. The rateable value tariff charges have been reduced proportionately, both as regards the fixed half-yearly tariff and sliding-scale rates. Very substantial reductions have been made also in hire charges for appliances. The reductions take effect as from June 30th.

Sittingbourne (Kent).—OVERHEAD LINES.—The Kent Electric Power Co. is to erect overhead lines along Sutton Baron Road, Borden, and at Conyer.

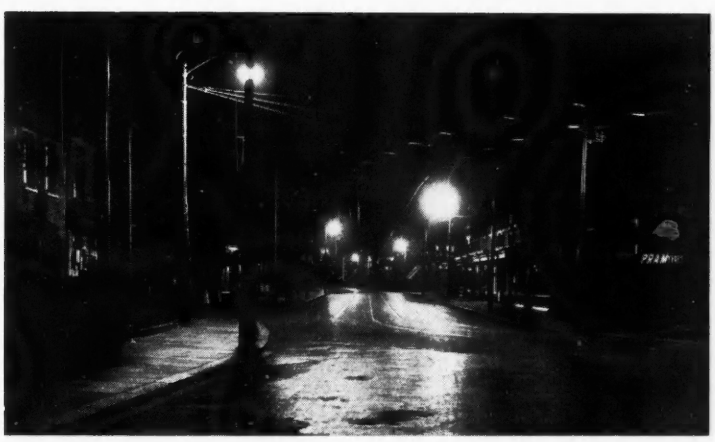
Skipton.—REVISED TARIFFS.—A revised tariff for electricity has been announced by Mr. W. V. Smythe, the electrical engineer. From ½d. per kWh the domestic tariff is reduced to three kWh a penny and the flat rate from 5d. to 4½d. per kWh. Through prepayment meters the charge is lowered from 6d. to 5½d. per kWh. Business premises will be charged as follows: First 100 kWh (instead of 200 kWh) per kW of maximum demand per quarter, 6d. per kWh. Domestic heating and power: All electricity at 1d. per kWh instead of all under 25 kWh per quarter at 3d. per kWh. Where only one rateable value is operating in respect of combined houses and shops the quarterly standing charge for the purpose of the domestic tariff is to be based on 25 per cent. of the total rateable value. The discount for prompt payment of accounts to be increased to 5 per cent. on all quarterly accounts over £5.

Smethwick.—SCHOOL LIGHTING.—The Education Committee has approved schemes drawn up by the consulting engineer for the electric lighting of schools, the total estimated cost being between £10,000 and £11,000. The council has already given its approval to the proposal, and the schemes have now to be submitted to the Board of Education for its approval.

Sunderland.—ILLUMINATIONS AT ROKER.—The annual illuminations display at Roker is to be held for four weeks commencing August 28th. One of the most interesting features this year will be a talking version of "Alice in Wonderland," in addition to other well-known characters on the screen and elsewhere. It is hoped that the attendance will reach half a million.

Sutton.—NEW INSTALLATION.—The London County Council is to reconstruct the electrical installation at the Sutton training centre at a cost of £5,300.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee is to carry out mains extensions to the Cockett Station estate (£1,000).



A new installation of electric discharge lighting at East Ham with Holophane "Bi-Way" reflectors enclosing 400-W "Sieray" lamps

Thornton Cleveleys.—ILLUMINATIONS.—The Council proposes to introduce a scheme of electrical illuminations during the autumn. The electrical engineer has been instructed to submit an estimate of the cost.

Walsall.—TESTING EQUIPMENT.—The Electricity Committee is to purchase testing equipment at a cost of £900.

MAINS AND SERVICES.—Sanction is being sought by the Electricity Committee to borrow £50,000 for mains and £25,000 for services.

ANNUAL REPORT.—The annual report of the Electric Supply Committee shows that the value of the sales of electricity rose by £31,115 to £195,218, and the sales and hire of apparatus from £18,883 to £22,591. The report of the manager (Mr. Ed. Newburn) shows that the total cost per "unit" sold was 0.94d., and the income 1.13d., compared with 1.01d. and 1.14d. respectively in the previous year. The amount of electricity sold increased by 21 per cent.; the number of consumers by 12 per cent.; and of the cookers hired by 58 per cent. There was an increase of 1,577 in the number of consumers taking

their supply on the two-part domestic tariff, and an increased sale of 2¼ million kWh under that system. The amount of electricity sold by the undertaking during the year was 47,473,104, kWh. The load factor of 36.5 per cent. was the highest so far recorded.

It is stated that since the Walsall power station was transferred to the West Midland J.E.A. the number of consumers has increased from 7,000 to 24,000, and the cost of electricity has been considerably reduced.

Wellingborough.—INSTITUTION SUPPLY.—A new service main is to be laid to the hospital block and nurses' home at the Public Assistance Institution by the Wellingborough Electric Supply Co., Ltd., and electric lighting is to be installed by Cooper & Sellers.

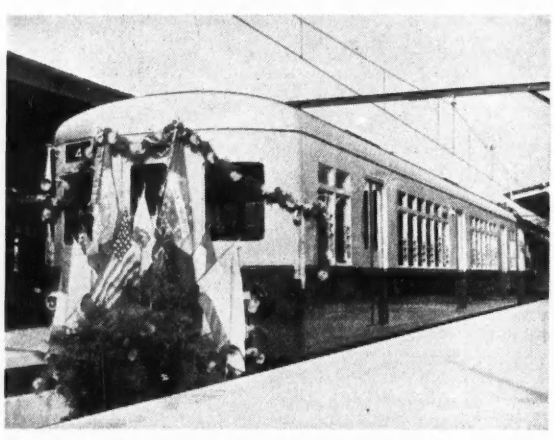
Weymouth.—SUB-STATION EQUIPMENT.—Sanction has been obtained to borrow £5,692 for the purchase of sub-station equipment.

REVISED CHARGES.—The Electricity Committee has decided that cinemas and theatres shall be offered a fixed charge based on floor area and a running charge of 1½d. per kWh.

Traction

Bath.—TRAMS TO GO.—An arrangement with the Bristol Tramways Co. has been approved by the City Council for the replacement of all trams by buses within three years.

Birkenhead.—THE LAST TRAM.—Trams have now been finally abandoned in Birkenhead, the system having been in existence since 1860. The first electric car, put into service in 1901 was driven by Mr. O. Murphy, who also drove the last tram.



The first electric train to run on the new Rio de Janeiro suburban electric railway opened on July 10th is shown in the picture decorated with English, Brazilian, American, Argentine and other flags. It was built by Metropolitan-Vickers

Coventry.—TRAM SERVICE DISCONTINUED.—The tram service between Hertford Street and the station has been discontinued, not, as is usually the case, because renewals were necessary, but owing to traffic difficulties.

Edinburgh. — TRANSPORT UNDERTAKING. — An increase of £39,588 in the combined revenue from tramway and motor bus services for the year ended May 28th last is reported by the Transport Department. The combined revenue was £1,096,907 and the total number of passengers carried was 195,165,511. The total revenue from the tramway services for the year was £816,483, compared with £807,535 last year, and the number of passengers carried was 147,056,982, an increase of 1,309,533, the total mileage run being 13,576,115, as compared with 13,122,645 last year. The total operating cost per car-mile during the year was 12.03d. The amount of electricity used for traction purposes was 29,927,630 kWh (1,233,340 kWh increase) at a cost of 0.7d. per kWh. The number of electric service cars owned by the Corporation was 360. There is a surplus of £9,334.

France.—A LARGE ELECTRIC LOCO.—An electric locomotive rated at 4,400 h.p., built to draw trains to the Riviera as far as Menton, has just been delivered to the P.L.M. railway, and is to undergo tests in the near future, states a *Reuter* message from Paris. It will draw a 450-ton train over the distance of nearly 700 miles in 10½ hours running time.

Newcastle.—TRIAL RUN OF ELECTRIC TRAIN.—A test run of one of the new electric trains which the L.N.E.R. is to operate on the Newcastle-Coast loop route is being arranged for to-day. The company is introducing new rolling stock to speed up the present service on the north side of the Tyne and is to place the renovated rolling stock in service on the Newcastle-South Shields line, the electrification of which is nearing completion.

Portsmouth. — TROLLEY-BUSES. — The Transport Committee has obtained sanction to borrow £209,335 for the substitution of trolley-vehicles for tramways.

South Shields.—TROLLEY-BUSES.—The Corporation is to spend £12,900 on six trolley-buses to be acquired in connection with extensions of the services.

Communications

Belgium.—RELAYS REJECTED.—Protests by manufacturers and traders has led the various communes forming Greater Brussels to reject the plan to institute inter-communal radio relay services.

Great Britain.—RADIO RELAYS.—At the luncheon of the Relay Services Association on Monday an appeal was made for a statement regarding the Government's future attitude toward's radio relay services. The Post Office is carrying out experiments with relay services and has extended the validity of existing licences only until 1939, which, it is argued, is not long enough to enable proprietors of services to plan ahead.

Russia.—TELEVISION EXHIBITION.—It is reported that in connection with the twentieth anniversary of the Soviet regime a television exhibition is to be held in Moscow this autumn.

Domestic Boiling Plates

How to standardise tests for comparison of performance

INVESTIGATIONS made by the British Standards Institution have indicated that the time is not yet ripe for the standardisation of the performance of electric boiling plates intended for domestic cooking purposes. There is, however, need for agreed methods of testing which will enable the various types and makes to be compared fairly. With this object there has just been published B.S.S. No. 744-1937, based on report No. Z/S1 of the British Electrical and Allied Industries Research Association, which detailed the results of an experimental determination of the capabilities and susceptibilities of these appliances.

A minimum standard of performance has not been laid down, nor has any attempt been made to define the relative importance of the various properties for which the tests are provided. The most important of these include speed of boiling, efficiency, length of useful life and insulation resistance. They are to so large an extent mutually incompatible that resulting compromise is invariably, and materially, influenced by personal opinion. Therefore, for the present, the user is left to form his or her own opinion individually.

The new specification relates to boiling plates designed for 230 V, the actual loading not to vary from the nominal by more than ±5 per cent. at that voltage. The number of any one type to be tested must not be fewer than six, the mean representing the boiling time. They must be taken from stock without special adjustment or machining, and reference is made to the importance of adopting approved methods of mounting and of shielding during the tests. The types, dimensions and weights of vessels employed (and varying quantities of water to be boiled) when testing differing sizes of hotplate are specified.

The temperature range defined will not be attainable in tropical countries, so that another range will have to be selected; while when determining thermal efficiency the transformer losses must be included in the energy dissipated by the plate if the latter is of the step-down low-voltage type.

For life tests not fewer than twelve hotplates must be used. To save time an estimate may be based on wire temperature, &c., but in any case the test period must not be less than 500 hours on circuit in order to reveal any serious defects.

Preliminary ageing is called for and the test must be made with a.c. (one side earthed), the mean voltage to be determined after one hour. The conditions laid down for life testing provide for periodical removal, at the expiration of each 100 hours on circuit, for subjection to additional tests designed to reveal the effects of use on performance. These include re-checking the boiling times to indicate any changes due to variation both in loading and distortion, as well as the application of thermal and mechanical shocks in accordance with methods laid down in the appendices. The latter also indicate how leakage current and insulation resistance shall be measured, and how to control the humidity of the atmosphere while doing so.

In the case of transformer-operated boiling-plates when the secondary voltage does not exceed 35 V, insulation resistance and dielectric tests may be omitted.

Exceptionally good performance from one point of view can easily be obtained by sacrificing other equally important properties. Therefore, when estimating general quality, it is most necessary to take into proper account the results of all the tests specified. In particular, the results of dielectric voltage tests should always be assessed in conjunction with both hot and cold insulation resistance values.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—August 3rd. County Council. Electrical work at twenty houses at Insch. W. L. Duncan, architect, Turriff.

Australia.—MELBOURNE.—August 23rd. Harbour Trust Commissioners. Two 3-ton semi-portal electric cranes. (T.Y. 24974/37.)*

August 17th. Posts and Telegraphs Department. Accumulator plates and separators. (T. 25450/37.)* Trunk telephone and telegraph cable. (T. 25307/37.)*

October 12th. State Electricity Commission of Victoria. One 30,000-kW steam turbo-generator, complete with condensing and accessory plant. (July 23rd.) Switchgear, including compound-filled circuit-breakers, current transformers and accessories. (T. 25684/37.)*

BRISBANE.—September 20th. City Electric Light Co. Feeder panels. (T.Y. 25700/37.)*

Bingley.—August 11th. U.D.C. Electricity Department. Electrically propelled tower wagon; 120 400-W mercury-discharge lamps, refractor bowl type, vertical burning, with all necessary auxiliaries. (See this issue.)

Blackpool.—August 14th. Borough Council. Four vertical-spindle axial-flow pumps and one drainer pump, together with electric motors, starting gear and necessary accessories, for the Lennox Gate pumping station. Borough surveyor, Municipal Offices, Talbot Square (deposit £1 1s.).

Bridlington.—August 9th. Town Council. H.v. and l.v. sub-station equipment. (See this issue.)

Cheadle and Gatley.—August 6th. U.D.C. Electricity Department. 6.6-kV and medium pressure switchgear, also 350-kVA oil-cooled transformer, with automatically operated on-load tap-changer. (July 23rd.)

Cirencester.—August 5th. U.D.C. Two sets of electrically driven vertical-spindle multi-stage centrifugal pumps (15,000 gal. per hr. each), with switchgear, control gear, water and electric meters, &c., for the new pumping station at Baunton. Binnie, Deacon & Gourley, Artillery House, Artillery Row, London, S.W.1 (deposit £10).

Edinburgh.—September 13th. Borough Council. Two feed pumps, de-aerator, evaporator, pipework, &c., at the Portobello generating station. (July 16th.)

Egypt.—CAIRO.—August 31st. Ministry of Public Health. 420-kW generating set, consisting of a three-phase alternator direct coupled to a vertical-type Diesel motor, in connection with the first extension of the new power station at Assiout. (T. 25185/37.)*

Halstead.—July 31st. R.D.C. Two sets of electrically driven unchokeable centrifugal pumps. J. Taylor & Sons, engineers, Caxton House, London, S.W.1 (deposit £5).

Harrogate.—August 4th. Corporation. Various works, including electrical, in connection with the proposed new school at Woodlands, Wetherby Lane. Office of the Borough Engineer, Municipal Offices.

India.—SIMLA.—August 14th. Stores Department. Electric lamps. (T. 25004/37.)*

August 28th. Electric lamps for the beacon and floodlighting installations at the civil aerodromes in India and Burma. (T. 25702/37.)*

Irish Free State.—DUBLIN.—August 6th. Minister of Defence. Electrical supplies, fittings, &c., during the period from September 1st to March 31st, 1938. Secretary, Department of Defence (Contracts Section), Parkgate.

SLIGO.—August 17th. Corporation. Wiring 136 houses at Abbeyquarter. Town clerk (deposit £2 2s.).

Kingston-upon-Thames.—August 30th. Corporation. P.i. cables. (See this issue.)

Leighton Buzzard.—August 19th. U.D.C. Vertical centrifugal borehole and booster pump (12,000 g.p.h. capacity), with electric motor, metering equipment, &c. Sands & Walker, consulting engineers, Milton Chambers, Nottingham (deposit £2 2s.).

London.—COMMISSIONERS OF WORKS.—August 4th. Electrical accessories. (July 23rd.)

August 24th. Generating plant, including back-pressure turbo-generators, switchgear, transformers, cables, &c. Room 65D, 3rd Floor, H.M. Office of Works, S.W.1 (deposit £1).

Manchester.—August 20th. Waterworks Committee. Three electrically driven multi-stage centrifugal pumps, with automatic control and switchgear, pipes, valves, &c. Chief engineer, Waterworks Offices, Town Hall (deposit £1 1s.).

New Zealand.—WELLINGTON.—October 12th. Public Works Department. 110-kV outdoor switchgear and steelwork. (T.Y. 24915/37.)*

August 31st. Post and Telegraph Department. Telephone cable. (T. 25593/37.)*

Plymouth.—August 21st. City Council. Conversion of various lifts from d.c. to a.c. (July 23rd.)

Portsmouth.—September 2nd. Electricity Undertaking. 33-kV switchgear at the generating station. (See this issue.)

Preston.—September 3rd. Corporation. Electrical wiring at the Preston Institution, Fulwood. (See this issue.)

Salford.—August 11th. City Council. Electrical installation in new wing being erected at the Museum and Art Gallery, Peel Park. City electrical engineer, Electricity Department, Frederick Road.

South Africa.—JOHANNESBURG.—August 14th. City Council. Rotary convertors, machine and starting panels, with instruments and necessary cables, &c. (T. 25180/37.)* H.v. switchgear and accessories, including control panels. (T.Y. 25108/37.)*

August 18th. L.c. telephone cable. (T. 25692/37.)*

August 21st. Electricity Department. Iron-cored oil-immersed current-limiting reactors and associated equipment. (T.Y. 25820/37.)* Automatic convertor equipment. (T. 25819/37.)*

PRETORIA.—August 20th. Public Works Department. Switchgear. (T. 25111/37.)*

CAPE TOWN.—August 4th. Electricity Supply Undertaking. Transformers, copper wire, steel lighting poles and fittings, insulators and two switchboards. (T. 25187/37.)*

August 25th. Transformers. (T.Y. 25719/37.)*

Torquay.—August 18th. Electricity Undertaking. 33/11-kV transformers and switchgear, 33-kV, 11-kV and auxiliary cables and 33-kV overhead lines. (July 16th.)

West Lancashire.—August 11th. R.D.C. Two automatic electrically operated sewage pumps, one set of electrically operated automatic screening plant and aeration unit equipment, for the Maghull sewerage scheme. H. B. Ward, consulting engineer, 26, North John Street, Liverpool, 2 (deposit £5 5s. in each case).

West Riding.—August 16th. Mental Hospital Board. Wiring in connection with the installation of electric lighting in the Admission Hospital and two convalescent villas at the Menston Mental Hospital, near Leeds. W. E. H. Burton, architect and engineer to the Board, Mental Hospital, Wakefield (deposit £2 2s. to the clerk of the Board, Victoria Chambers, Wood Street, Wakefield).

Whiston.—August 18th. R.D.C. Automatic electrically operated sewage pumping plant, one set of electrically operated automatic screening plant, three revolving sewage sprinklers, valves, pipework, &c., for the Halewood sewerage scheme. H. B. Ward, 26, North John Street, Liverpool, 2 (deposit £5 5s. in each case).

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—NEWCASTLE (N.S.W.).—Electricity Supply Department. Accepted. Aerial cables (£1,699).—Enfield Cable Works.

MELBOURNE.—Municipal Council. Accepted. Totally enclosed metal-clad switchgear.—A. Reyrolle & Co. (£7,739); Siemens (Australia) Pty., Ltd. (£3,179).

ROCKHAMPTON.—City Council. Accepted. H.d. copper cable (£1,116).—Enfield Cable Works (A'sia) Pty., Ltd.—*Tenders.*

Birmingham.—Hospitals Committee. Recommended. X-ray equipment (£1,562).—Victor X-ray Corporation, Ltd.

Electricity Committee. Accepted. Supplies from May 21st to July 13th: Switchgear in connection with the modifications to cellular switchgear at Dale End sub-station.—Ferguson Pailin, A.c. and d.c. distribution boards at Hams Hall power station.—Siemens Bros. Battery repairs at Chester Street sub-station.—Chloride Electrical Storage Co. E.h.v. metal-clad switchgear at Bartley Green sub-station.—G.E.C. One 5-ton electric hoist at the Hams Hall station.—Herbert Morris, Ltd.

Bristol.—Health Committee. Recommended. Electrical work at Southmead Hospital (£6,304).—C. F. Williams.

Croydon.—Electricity Committee. Recommended. Exhauster for boiler suction sooting plant (£552).—Sturtevant Engineering Co. Ash-handling plant (£1,702).—Bennis Combustion, Ltd. Meter testing apparatus (£627).—Zenith Electrical Co.

Darlington.—Town Council. Accepted. Switchgear.—A. Reyrolle & Co.

Durham.—County Education Committee. Accepted. Electric lighting installation in schools: Greencroft Council.—T. W. Atkinson; Murton Colliery Council and Ryhope Street Council.—F. Reid, Ferens & Co.; Stillington Council.—R. Robson.

Ealing.—Electricity Committee. Accepted. Supplies for twelve months: Meters.—Ferranti, Ltd.; Venner Time Switches, Ltd. Insulating tapes.—G.E.C.; Callender's. Compounds.—Dussek Bitumen & Taroleum.

Hendon.—Town Council. Accepted. Electric lighting at the junior and senior schools at Edgware (£388).—G. A. Weston.

Lanarkshire.—County Council. Accepted. Electrical work in connection with the erection of 238 houses on the Craigendmuir estate, Stepps (£1,787).—Walters & Gibson.

London.—BATTERSEA.—Electricity Committee. Recommended. Electric vehicle (£293).—Corporation Electric Transport, Ltd.

CITY OF LONDON.—Schools Committee. Re-wiring City of London school:

	£		£
H. Page & Sons. Recommended	**248**	Pinching and Walton	383
C. J. Bartley & Co.	326	Bell Bros. & Co. (London) ...	396

Music Committee. Recommended. Switchboard for the Guildhall School of Music (£234).—Strand Electric & Engineering Co.

ISLINGTON. — Electricity Committee. Accepted. Electric cookers.—Hotpoint Electric Appliance Co. (£229): Jackson Electric Stove Co. (£231); Falk Stadelmann & Co. (£226).

L.C.C.—Hospital and Medical Services Committee. Wiring and fittings for alterations and additions to the main cable system, re-wiring electric lighting and power systems, &c., in existing buildings and the installation of electric lighting, power, telephone and bell systems in the new isolation blocks, &c., at Brook Hospital, Shooter's Hill:

	£		£
Samuel Reed & Sons. Accepted	**14,198**	W. J. Furse & Co. (London) ...	17,652
Archibald Meckhonik	14,389	Holliday & Son (Electrical) ...	17,701
T. Clarke & Co.	14,651	Buchanan and Curwen ...	17,846
Read and Partners	17,076	Duncan Watson (Electrical	
Alexander Hawkins & Sons ...	17,451	Engineers)	19,555
G. E. Taylor & Co.	17,511	The chief engineer's comparable	
H. J. Cash & Co.	17,641	estimate is £14,860.	

In addition it will be necessary to change the voltage of cer-

tain electro-medical and other apparatus and to maintain temporarily certain existing services. The estimated cost of these works is £225, making a total of £14,423.

METROPOLITAN WATER BOARD.—Two electrically driven pumps for the waterworks near Hammersmith.

	£
Pulsometer Engineering Co. Recommended	**2,295**
Ditto (alternative)	2,348
Gwynnes Pumps, Ltd.	2,599
W. H. Allen, Sons & Co. ...	2,615
Worthington-Simpson, Ltd. ...	2,820
Harland Engineering Co. ...	2,825
Mather and Platt, Ltd.	2,862

WANDSWORTH.—Borough Council. Accepted. Wiring of houses, maisonettes and flats (£14,187).—Fullick & Looseley, Ltd.

STEPNEY.—Electricity Supply Committee. Accepted. Twelve weldless steel tubular lamp columns (£118).—Bromford Tube Co. 30-A switch fuses required during the period ending July 31st, 1938:—

	£
Wholesale Fittings Co. Recommended	**307**
Ditto (alternative)	324
Foster Engineering Co.	311
P. L. Dwyer & Co.	317
Falk, Stadelmann & Co.	317
Wilec, Ltd.	322
Ditto (alternative) ...	331
Sloan Electrical Co.	324
Ditto (alternative)	341
W. White & Co.	337
Ditto (alternative) ...	356
General Electric Co.	662

Accepted. Forty-eight new lanterns for street lighting improvements (£222).—Edison Swan Electric.

Manchester.—Town Council. Accepted. Electric lighting at the electricity showrooms.—G.E.C.

Middlesbrough.—Town Council. Accepted. Two 600-kVA transformers (£320 each).—Electric Construction Co.

Monifieth.—Town Council. Accepted. Electrical work at thirty-two houses on the Wellbank and Tay Street estates (£252).—A. & C. Edelman.

Newcastle (STAFFORDSHIRE).—Town Council. Accepted. Overhead wiring and services at 217 houses on the Cross Heath estate (£550).—W. Truswell & Son.

Newcastle-on-Tyne.—City Council. Accepted. Electric lighting instalation at Cambridge Street school (£300) and Delaval school (£130).—Fletcher Bros.

Troon.—Town Council. Accepted. One 60-kW electrode heating boiler for the swimming baths.—Bastian & Allen.

Notes

Dalmarnock Extensions

The accompanying picture shows the present stage of construction of the 100,000-kW extension to Dalmarnock generating station of Glasgow Corporation, the cost of which is given as about £1,000,000. Two 50,000-kW turbo-alternators by C. A. Parsons & Co., Ltd., are being installed in conjunction with six 200,000 lb. per hr. boilers by Yarrow & Co., Ltd., who are responsible for the complete boiler-house equipment, including economisers, air-heaters, fans, grit catchers, coal- and ash-handling plant, piping, building and foundations. The steam conditions at the stop valves of the new boilers are 625 lb. per sq. in. (compared with 275 lb. in the existing boiler house) and 850 deg. F. When the new sets are in commission the installed capacity of the station will be 238,500 kW.

Electrodeposition of Tin

Although acid baths for the electrodeposition of tin are attractive because of their high efficiency and the fact that they can be worked at room temperature, they are unstable solutions and the deposits tend to be patchy and in loosely adherent needles. To some extent addition agents enable these drawbacks to be overcome. Further research to improve these addition agents has been carried out on behalf of the International Tin Research and Development Council, which has just published the results in Technical Publication **Series A, No. 56, in which Messrs. A. W. Hothersall and W. N. Bradshaw show that additions of sulphonic acids, such as those of cresol phenol or benzene, are ineffective when the acids are pure. Crude qualities, however, contain certain by-products of sulphonation which enable smooth deposits to be obtained, especially when gelatin is present, but the solutions deteriorate rapidly and have poor covering power. Hydroxy compounds of the aromatic hydrocarbons, such as β-naphthol and resorcinol, are most effective and they can be used with gelatin or the more stable lysalbic acid which is prepared from egg albumen. A solution was found which had good covering and throwing power and was substantially unimpaired after long use.

The W.E. Highfield Shield Competition

The Association of Supervising Electrical Engineers announces the 14th annual competition for the W. E. Highfield Shield, which was presented for competition by Mr. W. E. Highfield, M.I.E.E., past-president of the Association. In addition to the Shield, there will be cash prizes ranging from £2 2s. to £5 5s. The member winning the first prize will be the holder of the Shield for one year, and his name will be inscribed upon it. The papers must not exceed 2,000 words and the subjects must relate to the electrical industry and/or the Association. They have to be sent to the General Secretary by October 27th. The decision of the Examining Board will be announced in time for the presentation of the Shield and prizes at the lecture meeting on December 21st. The Association says that the literary style of papers is of minor importance, as the competition is to encourage papers of a practical nature and original thought.

A.P.L.E. Conference

The rendezvous of the Association of Public Lighting Engineers for its annual conference is Folkestone this year. The conference will commence on Monday, September 6th, with the Council meeting, annual general meeting and a dance. A civic welcome will be given to delegates on the Tuesday and the presidential address will be given by Mr. C. I. Winstone, followed by papers on "The Application of Modern Electric Lamps to Street Lighting" by Mr. G. H. Wilson and "Some Further Experiments in Street Lighting" by Dr. S. English and Mr. E. Stroud. Two papers on gas lighting will be read on the Wednesday and the annual banquet and dance will take place in the evening. "Planned Street Lighting," by Messrs. T. Catten and G. S. C. Lucas, is the subject of a paper with film demonstrations for the concluding day (Thursday), on which another gas paper is being presented. A special programme is being arranged for the ladies.

Lubrication

The Institution of Mechanical Engineers, in co-operation with forty other technical bodies, is arranging a three-days' general discussion on lubrication and lubricants (October 13th to 15th), when some 140 papers by leading authorities in all parts of the world will be presented. Among them will be a number of steam-turbine and electrical interest. The subjects under discussion are to be illustrated by an exhibition at the Science Museum, South Kensington, which will remain open for a fortnight from October 13th.

Appointments Vacant

Borough electrical engineer for Darlington.

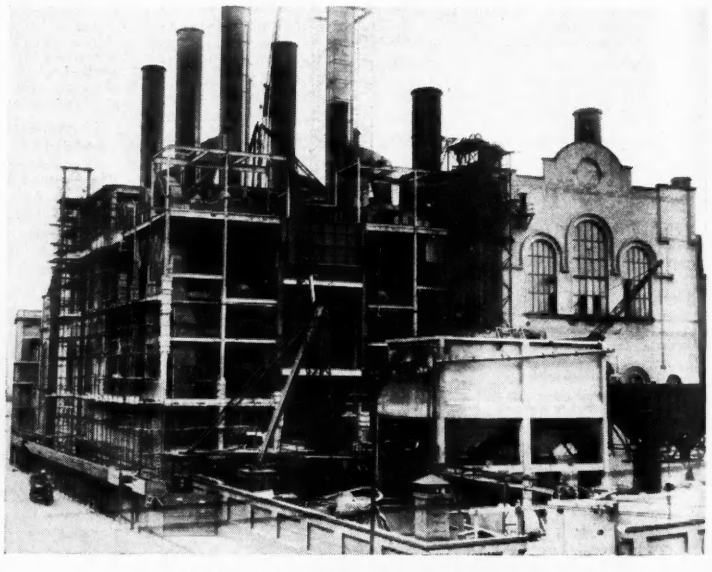
Lady demonstrator for the Aylesbury Electricity Department.

Meter superintendent for the Worksop Electricity Department.

Laboratory assistants for the Air Ministry.

Mains assistant for the Ealing Electricity Department.

Engineering clerk of works at the Redhill County Hospital for the Middlesex C.C.



The extension of the Dalmarnock station now in progress

Assistant mechanical and electrical engineers for the Air Ministry.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Roasting spit, electrically operated.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. A. Robertson, deputy borough electrical engineer at Preston, is recommended for the post of borough electrical engineer in succession to Mr. D. Adams, who is retiring. If appointed, Mr. Robinson, who is thirty-two, will be one of the youngest borough electrical engineers in the country.

Sir **Henry Walker,** Chief Inspector of Mines, is to retire next March.

The following appointments to the new Quebec Provincial Electricity Commission are anounced: Mr. Joseph Gingras, president; Mr. L. Prefontaine, vice-president; and Messrs. O. Lefebvre, M. McCammon, and C. E. Dube, members.

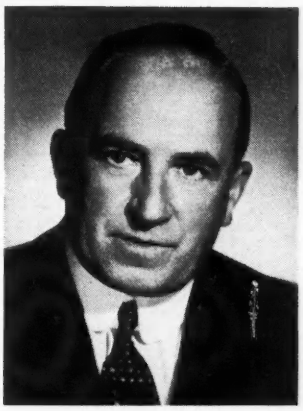
Coventry Education Committee has confirmed the appointment of **Mr. John G. Fleming,** A.M.I.E.E., as head of the Electrical Engineering Department of Coventry Technical College. Mr. Fleming, who is thirty-six years of age, has been assistant lecturer at Battersea Polytechnic since 1926.

Croydon Corporation Electricity Committee has appointed Mr. W. **Dewhurst** (Walthamstow) and **Mr. T. Shaw** (North Eastern Electric Supply Co.), as control engineers.

Mr. T. C. Daniels, principal of the Chichester firm of electrical contractors bearing his name, was married on July 22nd at Petworth Parish Church to Miss M. Jeffery, of Petworth.

As the work in connection with the change-over will be completed shortly, the Dover Electricity Committee has agreed that the temporary anual bonuses of £50 and £30 respectively paid since May, 1933, to the mains superintendent (**Mr. H. E. Osborne**) and the assistant mains engineer (**Mr. G. R. Plater**) shall be discontinued from September 1st. next, and that the temporary increase of £50 paid to the senior shift engineer (**Mr. T. R. Amos**) shall also cease from that date. The chairman, Councillor Martin, and the chief clerk are to visit the Bexhill-on-Sea undertaking to obtain information as to the staff employed there so that a comprehensive report on the future status of staff may be prepared.

Mr. A. J. Macphail, publicity manager, of British Insulated Cables, Ltd., was invested last Friday as an Officer of the Order of St. John of Jerusalem at the Chancery of the Order, London. He recently received a medal for forty years' service with the company. Starting in the accessories department, of which he was appointed chief in 1898, he became in 1899 engineer in charge of various contract work at Beckenham, West Bromwich, Dundee, etc., subsequently becoming representative engineer for the sale of accessories. He was called up at the outbreak of war and was seriously wounded in the second battle of Ypres, being discharged from the Army in 1917 as unfit. He returned to Prescot as chief assistant to Mr. W. A. Wilson, the commercial engineer, and on the latter's retirement the sales of the company were taken over by a sales committee of which he became a member as publicity manager, which position he still holds.



Mr. A. J. Macphail

Sir Edward Crowe, K.C.M.G., is retiring from the office of Comptroller-General of the Department of Overseas Trade on October 1st. He will be succeeded by **Mr. T. St. Quintin Hill,** C.M.G., O.B.E., a principal assistant secretary of the Board of Trade.

One of our readers wishes to get into touch with **Mr. Richard Marmion,** who about ten years ago was with the Cork Electric Tramways and Lighting Co., Ltd. If Mr. Marmion will communicate with us we will send him our inquirer's name and address.

Mr. J. Stinton Jones has been recommended by the Hammersmith Town Hall Committee as consulting engineer for the heating, ventilating and electrical works for the new Town Hall.

Mr. W. B. Williams, who has been connected with the firm of Rouch & Penny, the well-known electrical contractors of Bristol, since 1903, celebrates his golden wedding to-day (Friday). He first entered the electrical industry in the service of the late firm of King, Mendham & Co., Bristol, and was president of the Electrical Contractors' Association for 1932-33.

Officers of the Central Electricity Board in the South-West England and South Wales Area after a golf match at Weston-super-Mare. The winner, Mr. E. R. Cooper, is shown holding the trophy

Edgar Allen & Co., Ltd., has appointed **Mr. Richard Holt** manager of its magnet department in place of Mr. H. E. Kershaw, who has resigned, but will continue to act as consultant.

Mr. P. W. Fassler

Mr. P. W. Fassler, president of the Fassler Welding Machine Co., Inc., Detroit, Michigan, has arrived in this country. He is one of the leading electric welding specialists of America and expects to spend some considerable time here in studying existing welding methods in our automobile and general sheet-metal trades. During his stay he will act as electric welding consultant to E. H. Jones (Machine Tools), Ltd., Hendon, who have the sole selling rights for Fassler electric welding machines in Great Britain.

Obituary

Mr. J. P. Dawson, of the survey department of the Clyde Valley Electrical Power Co., died on July 19th at Aberdeen. Before the war Mr. Dawson was in charge of the electric power station at Fochabers. Then he went to Lewis under the Leverhulme Welfare Scheme. Following that he joined the staff of the Clyde Valley Electrical Power Co.

Mr. G. Egles.—We regret to record the death on July 16th of Mr. Gabriel Egles, for many years chief estimating clerk to Laurence, Scott & Electromotors, Ltd. Mr. Egles, who was fifty-eight, received his training with Laurence, Scott & Co., joining the firm in 1896 when manufacture was still carried out in the original works started in 1883. He was thus a direct link with the earliest days of the company and was the senior member of the staff at the time of his death. Mr. Egles will be missed by all his colleagues, as well as by many other friends and the members of the Norwich Engineering Society, of which he was a founder member and past-president. The funeral was at St. Peter's Church, Cringleford.

The late Mr. G. Egles

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Sinex Engineering Co., Ltd.—Private company. Registered July 21st. Capital, £2,000. Objects: To carry on the business of manufacturers, importers and exporters of and wholesale and retail dealers in electrical and other machinery, plant, apparatus and instruments, &c. The directors are: E. Damond (permanent governing director), 28, Rue des Annelets, Paris (director of Cie. Auxiliare d'Entreprises Electromécaniques E. Damond et Cie.); W. R. Howard, 3, Graham Road, Hendon, N.W.4 (director of Vibrated Construction Co., Ltd.); W. H. Percival, 71, Bromley Road, Beckenham, Kent; and M. Semet, 14, Palmer Street, S.W.1 (director of M. Semet & Co., Ltd.). Secretary: Alfred Clay. Registered office: 14, Palmer Street, S.W.1.

H. Howson & Co., Ltd.—Private company. Registered July 22nd. Capital, £1,000. Objects: To carry on the business of electrical, lighting, heating, wireless, mechanical and general engineers and engineering contractors, &c. The subscribers are: H. Howson, 19, Bowshaw Estate, Dronfield, near Sheffield, and S. Yates, Dyche Lane Farm, Norton, Sheffield, 8. The first directors are: H. Howson and others to be appointed by the subscribers.

Radio Service (Hendon), Ltd.—Private company. Registered July 22nd. Capital, £10,000. Objects: To acquire the business of a retail radio, television, sound recording, photographic and electrical dealer carried on by J. C. Lowe at 179, Station Road, Edgware, and 16, Watford Way, Hendon. The directors are: J. C. Lowe and F. A. Lowe, both of Leamington House, Edgware, Middlesex. Secretary: J. C. Lowe. Registered office: 179, Station Road, Edgware, Middlesex.

Instruments and Precision Engineering Co. (Huddersfield), Ltd.—Private company. Registered July 17th. Capital, £1,000. Objects: To carry on the business of mechanical and electrical engineers, metal founders, electroplaters, tinsmiths, &c. The directors are: H. Matthews (chairman and permanent director), Commercial Road, Skelmanthorpe, near Huddersfield, W. Elliott, Northfield House, Kirkburton, near Huddersfield, and F. Addy, Woodhouse, Shelley, near Huddersfield. Registered office: Wells Mills, Northgate, Huddersfield.

Metalcraft Manufacturing Company (Canada), Ltd.—Private company. Registered July 24th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps, fittings, shades, reflectors, bells, fires, stoves, cookers, insulators, motors, armatures, fans and accessories, electro-platers, nickel and chromium platers, metal and alloy makers, &c. The directors are: M. van Gene, 5, Pleydell Avenue, Stamford Brook, W.6; C. J. Pead, 168, Longlands Road, Sidcup, Kent; and F. N. R. Warren, 4, Berkeley Court, W.1. Secretary: Betty M. Brown. Registered office: 72, Newman Street, W.1.

Electric Converter Furnaces, Ltd.—Private company. Registered July 24th. Capital, £5,000. Objects: To carry on the business of manufacturers of calcium, carbide, nitro-lime and cyanamide, ironmasters, iron and brass founders, steel makers, shipbuilders, electrical engineers, &c. The permanent directors are: T. D. Kelly, No. 5, 43, St. Peter's Road, Croydon, Surrey; and R. Blandy, Nod Cottage, Cookham Dene, Berks. Registered office: 190, Imperial House, Regent Street, W.1.

Returns of Electrical Companies

Tramways Syndicate, Ltd.—Capital, £2,500 in £1 shares. Return dated May 20th, 1937. 1,507 shares taken up. £7 paid. £1,500 considered as paid. Mortgages and charges, nil.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5. Return dated May 14th, 1937. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges, £48,763 19s. 11d.

Cawnpore Electric Supply Corporation, Ltd.—Capital, £547,986 in 200,000 preference and 347,986 ordinary shares of £1. Return dated June 1st, 1937. 200,000 preference and 200,000 ordinary shares taken up. £325,000 paid on 200,000 preference and 125,000 ordinary shares. £75,000 considered as paid on 75,000 ordinary shares. Mortgages and charges, £349,060.

Venner Time Switches, Ltd.—Satisfaction in full on July 14th of charge dated April 20th, 1931, and debenture dated November 17th, 1931, in favour of Westminster Bank Ltd., and registered April 22nd, 1931, and November 27th, 1931, respectively. (According to the register of mortgages the charges registered April 22nd, 1931, and the debenture registered November 27th, 1931, originally secured all moneys due to bank.)

Eureka Vacuum Cleaner Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 8th to secure all moneys due or to become due from the company to Barclays Bank Ltd.

East India Tramways Co., Ltd.—The nominal capital has been increased by the addition of £25,909 in £1 shares beyond the registered capital of £109,091.

Barlborough Electric Supply Co., Ltd.—Capital, £3,000 in £1 shares. Return dated May 20th. 2,967 shares taken up. £2,967 paid. Mortgages and charges, nil.

Hellyar & Sons, Ltd.—S. A. V. Wood, 31, Brook Green Road, Hammersmith, W.6, was appointed receiver and manager on July 12th under powers contained in mortgage debenture dated August 23rd, 1912.

William Geipel, Ltd.—Capital, £25,150 in 25,000 preference, 100 "A" ordinary and 50 "B" ordinary shares of £1. Return dated June 17th. All shares taken up. £23,650 paid. £1,500 considered as paid. Mortgages and charges, nil.

Small Electric Motors, Ltd.—Particulars filed of £10,000 debentures authorised July 12th charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued and ranking *pari passu* with debentures already registered.

Edward Wilcox & Co., Ltd.—Charge on land and premises to be erected thereon at Sharston Road, Wythenshawe, Manchester, dated July 10th, to secure £2,000, and all further sums hereafter to be advanced by the chargees (Lord Mayor, Aldermen and citizens of Manchester) to the company.

City Notes

The Anglo-Argentine Tramways Co., Ltd.—Although gross receipts for 1936 rose from £1,808,157 to £1,903,595, an increase in expenses from £1,849,086 to £2,017,286 produced a deficit of £113,691, which compares with £40,929 in 1935. An annuity to the City of Buenos Aires Tramways Co. (1904), Ltd., requires £70,660, while interest on debentures (including arrears) totals £568,991, so that the total deficit for the year is £753,018, as against £656,433. The accumulated debit at December 31st last was £2,491,772. Payments for the year in respect of debenture stock interest were suspended and sinking fund obligations were cancelled under the terms of the moratoria granted in June, 1934, and extended in June, 1936. The directors' report states that the increase of 1 per cent. in gross receipts corresponds to the carrying of 5,854,054 more passengers, a fact which is attributable to the furtherance of the company's policy of accelerating and increasing services. The increase in expenses is accounted for mainly by (a) additional wages, power and other charges directly due to the running of extra car-miles, the adjustment of routes and the speeding up of services in general; (b) the increased cost of maintenance work rendered heavier by the improvements mentioned and by the unavoidable restriction of renewals in past years; and (c) increased track renewals effected concurrently with and largely consequent upon street improvements carried out by the municipality. Competition from buses has become more severe, but the improvement mentioned has largely counteracted this. The Urban Transport Co-ordination Bill became law on October 2nd last and the Special Commission provided for has since been appointed by the Argentine Government and is proceeding with its task of constituting and organising the new Corporation, under the management of which it is intended that the entire passenger transport of Buenos Aires shall in future be worked as a co-ordinated undertaking.

Falk, Stadelmann & Co., Ltd.—In spite of the difficult conditions prevailing during the past year, such as rising costs of raw materials and of production, and the shortage of skilled labour, Mr. Max Falk (chairman) presiding at the annual meeting held on July 22nd, was able to announce a steady progress in the company's trading. He said that they had experienced difficulty in procuring adequate supplies of many important raw materials required, and it was hoped that an alleviation of the position would soon be found, so that production would not fall below demand. In this respect they looked for some assistance from the reduced import duties on iron and steel recently introduced, although in view of the rearmament programme difficulties seemed likely to continue for some time. Nevertheless, their works had been well employed throughout the year, and since the close of the last financial year there had been some advance in output compared with the corresponding period of 1936.

The Young Accumulator Co., Ltd., shows a trading profit of £9,677 for the year ended March 31st last, as against £10,605 in the preceding year. The net profit was £5,224, as against £6,476. Adding £8,206 brought in and £6,563 from the share premium account there is £20,292 available, from which the directors propose to pay a 3 per cent. dividend (nil last year) and write off £13,434 for expenses on underwriting commission account, leaving £2,504 to be carried forward. The report states that the company's position has been strengthened by research and development work carried out and by the installation of additional plant and machinery of the latest type. During the year an issue was made of 100,000 shares at par and 525,000 shares at 2s. 3d., increasing the capital of the company to £193,479. Nearly the whole of the new capital was invested in shares of Associated Electric Vehicle Manufacturers, Ltd., which company holds the whole of the share capital of Electricars, Ltd., and A. E. Morrison & Sons, Ltd.

The Western Electricity Supply Co., Ltd., which is controlled by Edmundson's Electricity Corporation, Ltd., transferred its contracting section and the staff employed in the management and operation of certain supply undertakings to the companies controlling those undertakings as from January 1st last, and has accordingly decided to change the period of the financial year to that of the calendar year. The net profit for the six months ended December 31st was £72,644 (which compares with £89,173 for the year ended June 30th, 1936), plus £15,125 brought in. After providing £30,000 for general reserves and for dividend equalisation fund and paying dividends and bonus taking £40,500, a sum of £17,269 is carried forward. The dividend of 10 per cent., plus bonus of 5 per cent. on the ordinary shares, compares with 10 per cent. plus a bonus of 10 per cent. last year.

The London Electrical & General Trust, Ltd.—Speaking at the annual general meeting on Friday last week, Mr. H. S. H. Guinness, chairman, reminded shareholders that the field for profitable investment was tending to become narrower and increasingly difficult, particularly overseas, despite the improved conditions in most of the countries producing raw materials. At the moment American income tax, British income tax and N.D.C. together absorbed nearly 36 per cent. of the gross dividends on United States securities, and additional taxation

would render the returns from most of these investments quite unattractive. On the Continent exchange restrictions had resulted in a wide disparity between the official and the free market rate, the investor in many cases receiving less than one-half of the full income.

The Abitibi Power & Paper Co., Ltd.—Following the issue of an order by the Supreme Court of Ontario calling a meeting of bondholders on October 15th, a plan for reorganising the company, which has been in receivership for the past five years, has been issued by the bondholders' protective committee with the support of a committee representing the principal preferred stockholders. The plan provides for the formation of a new company to take over the Abitibi properties and issue new bonds, income debentures, and common stock in exchange for outstanding Abitibi obligations and stock, on which heavy arrears of interest and dividends are due. In addition it proposes to raise $14,000,000 of fresh capital by an issue of first mortgage 4½ per cent. bonds.

The United River Plate Telephone Co., Ltd., has arranged the issue of 25-year floating charge debenture bonds. In Switzerland an issue is being made amounting to 40,500,000 Swiss francs and 30,000,000 pesos will be issued in Argentina. A trust deed entered into with the Bank of England and South America provides for an additional amount of up to 40,000,000 pesos, which may be issued in Europe or Argentina. The Argentine issue will bear interest at 5½ per cent., and will be payable only in pesos, while the European issues will bear interest at 5 per cent., and will be payable in the currencies of the countries in which they are issued, but also at the option of the holder, at an agreed equivalent in Argentine pesos.

The Shawinigan Water & Power Co., Ltd., reports a gross revenue of $7,397,401 for the six months ended June 30th last, as compared with $6,658,489 for the corresponding half-year of 1936. After providing for operating expenses (including $12,000, against $50,000, reserve for exchange) amounting to $3,198,696 ($2,990,296), and fixed charges totalling $1,995,743 ($2,020,562), there is a surplus, before meeting depreciation and income tax, of $2,202,962 ($1,647,631). It is proposed to pay a dividend of 20 cents a share on the common shares for the quarter ended June 30th.

The Dublin United Tramways (1896), Ltd., is to pay an interim dividend of 1 per cent. (same) on its ordinary shares for the half-year ended June 30th.

The Para Telephone Co., Ltd., held its annual meeting on Tuesday. Presiding, Sir Francis M. Voules stated that although the outlook was obscured by the uncertainties incidental to the presidential election next year, trading conditions in Brazil continued to show a gradual recovery.

W. & T. Avery, Ltd.—A continuous and increasing demand for the company's products from all branches of industry, trade and commerce at home and abroad, was reported by Sir J. Fortescue Flannery, chairman, at the annual general meeting held on Tuesday. New machinery and equipment was being added wherever the directors thought it was in the interests of the company to increase productive capacity, and as opportunity offered they were replacing older machines with the most modern equipment available. Sales and service headquarters had recently been built at Birmingham, Newcastle, Leicester, Johannesburg and Sydney. Associated companies had all progressed.

The Southern Railway Co., Ltd., is to pay an interim of 2 per cent. on its 5 per cent. preferred ordinary stock, as compared with 1 per cent. last year. For the half-year ended June 30th receipts from passengers increased by £403,000, the receipts from goods traffic fell by £65,000, and the railway working expenditure was higher by £188,000. Taking into consideration an improvement of £60,000 in ancillary receipts the net revenue is approximately £210,000 more.

The Quebec Power Co., Ltd., reports a gross revenue of $1,938,429 for the six months ended June 30th last, as compared with $1,846,435 for the corresponding period of last year. Operating expenses amounted to $1,125,751 ($1,062,918), and fixed charges (including exchange) to $328,791 ($304,265), leaving a surplus (before providing for depreciation and tax) of $483,887 ($479,252). A quarterly dividend of 25 cents per share (same) has been declared. The company has decided to redeem all its outstanding first mortgage and collateral trust sinking fund gold bonds and registered stock, series "A," 5 per cent., on September 1st next, at 103½ per cent. of the principal sum, with accrued interest.

The Tokyo Electric Light Co., Ltd., reports that after setting aside 6,583,150 yen (against 7,298,616 yen for depreciation of fixed assets and investments, 12,333,355 yen (12,746,339 yen) for interest and 1,500,000 yen (same) for future losses on redemption of foreign bonds the net profit for the six months ended May 31st was 19,306,111 yen, as compared with 20,526,719 yen in the corresponding period of 1936. A dividend of 4 per cent. is being paid. The maximum output increased by 58,319 kW to 1,033,962 kW.

Companies Struck off the Register.—The following companies have been struck off the Register as from July 20th:—A-Z Electrics, Ltd.; Ebonestos Holdings, Ltd.; Electrical Equipment Repair Service, Ltd.; H. C. P. Radio, Ltd.; Honeysett Radio, Ltd.; New Phonopore Telephone Co., Ltd.; Picturetone Sound Equipment, Ltd.; Sunbeam Electric, Ltd.; Synba Electric, Ltd.; Western Broadcast Service, Ltd.; Wireless Accessories, Ltd.; and Wireless-Vision, Ltd.

The Palestine Electric Corporation, Ltd., is offering its shareholders the right to take up 500,000 4½ per cent. second redeemable cumulative preference shares of £1 each at par. The proceeds of the issue, together with the company's available resources, will permit the completion of the Reading power house under construction near Tel-Aviv and the extension of plant and transmission lines now in hand, but it is probable that a further issue of capital will be made at a later date.

United Dominions Trust, Ltd.—Sir J. Gibson Jarvie, chairman and managing director, stated at the annual general meeting on July 21st that the United Dominions Trust (Electric), Ltd., had made good progress and the demand for improved and modern household appliances was reflected in a large increase in transactions.

The Vera Cruz Electric Light, Power & Traction Co. reports operating revenues of 654,283 pesos for 1936, which compares with 603,811 pesos for the preceding year. Operating expenses rose from 627,753 to 673,807 pesos, leaving a deficit of 19,524 pesos (23,942 pesos).

The Electrolux Corporation of America announces that its consolidated net profit for the second quarter of 1937 was $843,867, an increase of $7,581, as compared with the corresponding period of 1936. Total earnings for the first six months have risen from $1,558,758 to $1,612,236.

Ismay Cables, Ltd.—The authorised capital has been increased from £100,000 to £200,000 by the creation of 70,000 preference shares of £1 each, 22,500 "A" ordinary shares of £1 each, and 150,000 "B" ordinary shares of 1s. each. The issued capital is now £150,000.

The Kalgoorlie Electric Tramways, Ltd., is to make a further distribution of 3½ per cent. on its 6 per cent. "B" debenture stock, of which £72,250 is outstanding. Interest was paid up to March, 1912, and arrears now amount to £142,105.

The Electrical Industries Trust, Ltd., is to make a distribution of 6 2/5d. per unit, tax free, representing the income received during the half-year ended June 30th and making 9 2/5d., tax free, for the year.

The Hungarian Trans-Danubian Electrical Co. reports receipts of P5,951,007 for the year ended December 31st last, as compared with P9,190,489 in the preceding year. There is a net profit of P125,229, plus P165,308 brought in, making P290,537.

Davis & Timmins, Ltd., are doubling the interim dividend on their ordinary shares at 10 per cent. This is payable on the capital as increased by the 20,000 5s. ordinary shares issued last April.

The London Electric Supply Corporation, Ltd., is paying interim dividends of 3 per cent. (same) on its ordinary and 6 per cent. preference shares.

The City of London Electric Lighting Co., Ltd., announces an interim dividend of 3½ per cent. (same) on its ordinary stock.

The London Associated Electricity Undertakings, Ltd., is maintaining its interim dividend at 3 per cent.

Mather & Platt, Ltd., have declared an interim dividend of 4 per cent. (same) on their ordinary stock.

The Yorkshire Electric Power Co. announces an interim dividend of 3 per cent. (same) on its ordinary shares.

The Rheostatic Co., Ltd., proposes to pay an interim dividend of 4 per cent.

Stocks and Shares

TUESDAY EVENING.

BUSINESS in Stock Exchange markets has fallen under the influence of the usual seasonal considerations and is now proceeding on jog-trot lines. The confidence of the public, severely shaken as it was, first by the ill-fated N.D.C. proposals, followed by the gold scare and later by foreign political developments, is beginning to revive. There is plenty of money available for investment, and many people admit a difficulty in knowing how to place it in such manner as shall ensure it against depreciation of capital. This, in fact, is regarded nowadays as being of almost equal importance with the obtaining of what may be termed a living rate of interest.

The general fall in prices that has occurred since the beginning of the year enables the investor to obtain 3½ per cent. on his money from gilt-edged securities, of which the War Loan is the representative example, but there are still too many factors of disturbance in the financial and political world for capital to feel entirely carefree in its choice of investments. Speculation is exceedingly quiet, but in the industrial group the steady demand for such shares as those in the electrical manufacturing group suffices to fortify quotations and to maintain the upward trend which has lately become noticeable.

Electricity Supply Shares

From the recent developments that have occurred in connection with the Government's proposals in regard to electricity supply, it may be surmised that dividends on the ordinary shares of the home electricity supply companies are not likely to vary to any great extent over the next year or two. Consequently, the group may be regarded as falling within the classification of sound industrials, which show a return on the money ranging from 4 to 4½ per cent. For investment that wants good security and stability of capital, the electricity supply list meets the requirements. Price movements are likely to be affected more by the fluctuations in gilt-edged securities and by the value of money than by other considerations. In this present week there have been a few small advances, but no movement of any importance.

Cable and Wireless

In the Cable and Wireless group, the feature is a recovery in the ordinary stock. After its fall of 5 points last week a rally of £3 has lifted the price to 81½. Attention is being turned also to the income stock, on the argument that it may be considered a first-rate security and that the 4 per cent. to which the stock is entitled has ample protection. The yield is a shade under 4 per cent., comparing with the £5 3s. 9d. per cent. obtainable from the 5½ per cent. preference stock. The latter is still regarded as being in the semi-speculative area, in spite of the excellence of the monthly traffic returns that are now appearing. It would seem likely that the reorganisation of capital having been completed, investors will

become more interested in the stocks as offering good channels, in their respective classes, for the employment of money. Globe Telegraph and Trust ordinary shares have firmed up to 16. The recent death of Marchese Marconi has had no effect upon the price of Marconi Marine shares, this remaining at 35s.

Stocks that are Wanted

People are often told nowadays that there is little demand for preference shares, and that fixed-interest securities of all kinds are out of favour. It may be of service to controvert this frequently heard statement by giving an occasional list of stocks and shares actually wanted in the Stock Exchange market and the prices at which they can be sold. The demand extends from debenture stocks to preference shares. Starting this week with the former, here is a selection from a list of securities for which there is a demand and the prices which buyers are prepared to pay:—

Debenture Stock.	Int. p.c.	Price bid.
Bournemouth & Poole Elec.	3½	99½
Bristol Trams & Carriage	4	102
British Electric Traction	4½	107
County of London Elec.	5	119½
Edmundsons Electricity	4	102½
Lancashire Electric	5	110
London Power	5	107½
North-Eastern Electric	5	104½
North Met. Power Station	3½ 2nd Deb.	102½
West Midlands J.E.A.	5	112½
Yorkshire Electric Power	5	106

American Industrial Shares

President Roosevelt is assumed to have had his wings rather severely singed by the refusal of Washington to pass his Supreme Court Bill. Congress threw it out and promptly a general rise occurred in American railroad and industrial issues. This rise has been accompanied by a widening of interest on the part of the public. Hitherto somewhat disinclined to put money into American utilities, people on this side of the Atlantic have rather favoured American railroad shares, but on the increasing evidence of industrial progress in the States they are now seeking particulars of shares in utility and similar corporations. Some people contend that the U.S.A. will recover its industrial prosperity in the same way as this country is now doing, and that, as America is a couple of years behind Great Britain in this respect, there is accordingly the greater scope for expansion of American companies' profits and share quotations. The lower-priced American utility shares are being sought, as well as those in the more investment class. Electrical issues stand in the forefront of the industrial issues for which people are now making inquiry. It is true that there is more of such inquiry than of business, but the latter frequently follows the former, and so it may be in this present case.

Manufacturing and Equipment Companies

The really cheerful spot in the electricity market is the strength shown by shares in the manufacturing companies. For these shares a persistent demand is afoot. Telegraph Constructions, which recently re-entered the dividend list, and on which an interim of 5 per cent. is declared, have come particularly into request, and, following up their recent rises, are 8s. 9d. higher at 52s. 6d. Johnson & Phillips gained 3s. 9d. on the top of last week's rise of half a crown. Electric Constructions are another good spot. General Electrics have advanced to 82s. British Insulated are up to 5. British Aluminiums are a firm feature with a rise of 2s. 3d. to 53s. 6d. It is said that these companies are not suffering to the same extent as a good many other industrial undertakings are, from shortage of the materials that are wanted by the Government and by themselves also. The Government requirements stand, of course, first. The electrical manufacturing and equipment trade is reported to be doing extremely well and it would seem as though some of the money which would be, in the ordinary way, going into fixed-interest securities, is finding its way instead into the ordinary shares of the manufacturing concerns.

Miscellaneous Matters

The interim dividend season has now commenced. On London Associated Electricity Undertakings shares the interim dividend is 3 per cent., on City of London Electric 3½ per cent., both of these being at the same rate as a year ago. New issues are beginning to make their appearance in greater volume than of late. Other countries as well as our own are finding that appeals for fresh capital meet with a fairly ready response. The United River Plate Telephone of Buenos Aires, which is controlled by the International Telephone & Telegraph Corporation, is making a bond issue of £3,700,000, partly in Switzerland, partly in the Argentine Republic.

It may be of interest to notice that there are still dealings, though very rare, in the old shares of the Marconi Company. These filter in occasionally in the shape of bearer shares, the certificates being marked £1 shares, though actually the shares became of the denomination of 10s. without the certificates being changed. This has led to a good deal of confusion, holders of what look to be £1 shares feeling indignant at being informed that these shares are really of 10s. each. The price in the market is 14s. 6d.

Stagnation continues to be the only feature in the rubber share market. At various meetings of rubber companies held lately, the chairmen have adopted a cautiously optimistic note in regard to the future of the plantations.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price July 27.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	33/–	—	4 11 0
Clyde Valley	1	7	8	39/–	—	4 2 1
County of London	1	10½	10½	49/–	+6d.	4 5 9
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	40/–	—	4 10 0
Elec. Dis. Yorkshire	1	9	9	41/–	—	4 7 10
Elec. Fin. and Securities	1	12½	12½	2⅛	—	4 13 0
Elec. Supply Corporation	1	11	12	52/–	—	4 12 8
Lancs Light and Power	1	7½	7½	34/–	+6d.	4 8 3
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	46/–	—	4 7 0
Midland Counties	1	7½	8	36/6	—	4 7 8
Mid. Elec. Power	1	8	9	2	—	4 10 0
North Eastern Electric Ordinary	1	6	7	32/6	—	4 6 2
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	45/–	—	4 9 0
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 2
Do. do. 6% Pref.	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/–	+6d.	4 6 8
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/–	—	6 10 4
Yorkshire Elec.	1	8	8	39/–	—	4 2 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	114	—	4 7 9
Do. 1955–75	„	5	5	116	+½	4 6 2
Do. 1951–73	„	4½	4½	109	—	4 2 7
Do. 1963–93	„	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	„	—	2½	87½	—	2 17 1
London & Home Counties, 1955–75	„	4½	4½	109	—	4 2 7
London Passenger Transport, A	„	—	4½	115½	—	3 18 3
Do. do. B	„	—	5	117½	—	4 5 1
Do. do. C	„	4	4	82	+1	4 17 9
West Midlands Joint Elec. 1948–68	„	—	5	111½	—	4 9 8
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	171½	+1	5 5 0
Anglo-Am. Tel. Pref.	Stock	6	6	123	—	4 17 7
Do. Def.	„	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	„	4½	5½	106	—	5 3 9
Do. Ord.	„	—	—	81½	+3	—
Do. Income	„	—	—	102	—	3 18 5
Globe Tel. & Tel. Ord.	10	4½*	5½*	16	+½	3 8 10
Do. do. Pref.	10	6	6	14½	—	4 5 9
Great Northern Tel.	10	20	20	41	—	4 17 5
Marconi-Marine	1	10	7½	1½	—	4 5 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	19½	–2	—
British Electric Traction Def. Ord.	„	5	5	1250	—	—
Do. do. Pref. Ord.	„	8	8	165	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	26	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	44½	—	—
Victoria Falls Ord.	1	20	12	65/–	+½	3 14 0
West Riding	1	6½	10	43/9	—	4 11 4
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2½	—	6 0 0
Assoc. Elec. Ord.	1	8	10	48/–	—	4 3 4
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	48/–	–9d.	4 3 4
British Aluminium Ord.	1	7½	10	53/6	+2/3	3 14 8
British Insulated Ord.	Stock	20	20	5	+1/8	4 0 0
Brush Ord.	Stock	Nil	Nil	49½	—	—
Callender's	1	15	15	4⅛	—	3 2 3
Do. 6½% Pref.	1	6½	6½	30/–	—	4 6 8
Crompton Parkinson Ord.	5/–	12½	12½	57/6	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	2	+½	5 0 0
Enfield Cable Ord.	1	25	25	5⅛	—	4 8 0
English Electric	1	Nil	Nil	33/–	—	—
Do. do. Pref.	1	6½	6½	26/–	—	5 8 4
Ericsson Tel.	5/–	20	25	2⅛	—	2 12 8
Ever Ready	5/–	35	45	33/6	—	6 12 6
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	82/–	+1/–	4 5 4
Henley's	5/–	30	15	19/3	—	3 17 10
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	47/6	+⅜	4 4 4
Lancashire Dynamo	1	10	20	3⅜	—	5 18 4
Siemens Ord.	1	6	7½	32/6	—	4 12 4
Telegraph Construction	£1	Nil	7½	2⅛	+7/16	2 17 2

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

27118. "Electrical testing apparatus." National Technical Laboratories. October 12th, 1934. (468138.)

29983. "Electrical testing apparatus." National Technical Laboratories. September 21st, 1935. (468208.)

32639. "Radio receivers." Ace Amplifiers, Ltd. December 13th, 1934. (468209.)

32762. "Electric generators." Raleigh Cycle Co., Ltd., and G. W. Rawlings. November 26th, 1935. (468065.)

33073. "Carriers of magnetic material for recording sound." Allgemeine Elektricitäts-Ges. November 28th, 1934. (468068.)

33131. "Process and device for interrupting heavy electric currents." P. Wangemann. November 29th, 1935. (468140.)

36007. "High-frequency iron core transformers." E. Michaelis. December 28th, 1934. (468364.)

36066. "Electromagnet relay time-delay circuits." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. December 31st, 1935. (468222.)

36104. "Electric battery lamps." J. Webber. December 31st, 1935. (468371.)

1936

42. "System of receiving a low speed repeating signal." Y. Watanabe. March 27th, 1935. (468229.)

43. "Apparatus for responding only to a predetermined series of electric signals." Y. Watanabe. June 2nd, 1935. (468230.)

75. "Radio transmitters and transmission systems." F. G. Frost and Sterling Works (Dagenham), Ltd. January 1st, 1936. (468289.)

141. "Electric totalisator systems." J. Handley, C. Suckling and R. H. Suckling. January 2nd, 1936. (468381.)

178. "Electrically-driven movements or motors." British Sangamo Co., Ltd., and G. F. Shotter. January 2nd, 1936. (468414.)

233. "Devices for momentarily interrupting electric circuits." J. A. Crabtree & Co., Ltd. (Schiele & Bruchsaler-Industriewerke Akt.-Ges.). January 3rd, 1936. (468235.)

297. "Screens for electric-discharge devices adapted to be rendered luminescent by the electric discharge." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen). January 3rd, 1936. (468238.)

1208. "Time bases for cathode-ray tubes." General Electric Co., Ltd., and D. C. Espley. January 14th, 1936. (468394.)

1875. "Mechanical scanning devices for television systems." J. G. S. Arathoon. January 21st, 1936. (468294.)

2702. "Protecting means for insulating by sheathed wires or rods in devices such as electric discharge devices." General Electric Co., Ltd., and A. G. Pearce. January 29th, 1936. (468247.)

3198. "Apparatus for diathermy and the like." General Electric Co., Ltd., and J. Bell. February 3rd, 1936. (468398.)

3214. "Electrothermal reduction of magnesiferous raw materials." W. H. A. Thiemann (I.G. Farbenindustrie Akt.-Ges.). February 3rd, 1936. (468250.)

3301. "Electrical socket couplings or socket outlets and switch-socket combinations." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. February 4th, 1936. (468251.)

3302. "Electrical couplings of the plug-and-socket type." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. February 4th, 1936. (468297.)

3545. "Electric measuring instruments." F. Moss, A. A. Trigg and Metropolitan-Vickers Electrical Co., Ltd. February 5th, 1936. (468253.)

6542. "Photo-electric cells." General Electric Co., Ltd., and C. H. Simms. March 4th, 1936. (468146.)

8435. "Automatic cut-out." V. J. Bemer. March 27th, 1935. (Cognate application, 8436/36.) (468148.)

12512. "Electrolytic condensers and the like." Mallory Patents Holding Co., Ltd. (P. R. Mallory & Co., Inc.). May 2nd, 1936. (468270.)

12688. "Electrical oscillation generators." Standard Telephones & Cables, Ltd. May 29th, 1935. (468271.)

14184. "Electric cooking apparatus." H. Beck. May 19th, 1936. (468150.)

14697. "Electric circuit breakers of the oil-immersion type." G. Ellison, Ltd., and J. Anderson. May 25th, 1936. (468153.)

21888. "Track-actuated train-control or signal systems." General Railway Signal Co. March 23rd, 1936. (468158.)

27921. "Firing horn for the ignition of submarine mines provided with apparatus for the autogeneration of electric energy." Soc. Anon. Pignone-Officine Meccaniche e Fonderia. October 15th, 1935. (468169.)

28430. "Radio receiving and other modulated carrier-wave apparatus." Marconi's Wireless Telegraph Co., Ltd. October 17th, 1935. (468172.)

28602. "Electric signalling cable." Felten & Guilleaume Carlswerk Akt.-Ges. October 30th, 1935. (468325.)

29727. "Electron-discharge devices for use in television and like systems." Fernseh Akt.-Ges. November 2nd, 1935. (468330.)

30166. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. November 5th, 1935. (468179.)

30841. "Systems for the electrical transmission of signals to railway locomotives." Svenska Aktiebolaget Gas-accumulator. November 11th, 1935. (468332.)

31113. "Very-high-frequency electrical oscillation generators." P.M.G. Toulon. November 13th, 1935. (468185.)

31715. "Electric contact mechanisms." British Thomson-Houston Co., Ltd. November 20th, 1935. (468187.)

33049. "Method of checking the sensitivity of mosaic photo-electric surfaces." Farnsworth Television, Inc. March 13th, 1935. (Divided out of 6255/36.) (468333.)

33978. "Device for sealing electric cable ends." F. S. Lobl. December 31st, 1935. (Divided out of 36117/35.) (468410.)

34047. "Television systems." F. Von Okolicsanyi. December 12th, 1935. (468191.)

34134. "Process and apparatus for the electrodeposition of metals." A. Cremer. December 12th, 1935. (Cognate application, 34135/36.) (468337.)

35149. "Electric furnaces and ovens." F. S. Grogan. December 22nd, 1936. (468193.)

1937

3853. "Stabilisation of television amplifiers." Radioakt.-Ges. D. S. Loewe. July 25th, 1935. (Divided out of 20555/36.) (468350.)

4928. "Electric welding." British Thomson-Houston Co., Ltd. February 21st, 1936. (Addition to 417692.) (468130.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 21st:—

Tubalox. No. 576096. Class 8. Electrical resistances. No. 576098. Class 18. Electric immersion heating installations for buildings.—George Bray & Co., Ltd., Bagby Works, Leicester Place, Leeds.

Safetaire. No. 575695. Class 11. Ultra-violet ray apparatus for sterilising air and gases for curative purposes.—Hanovia, Ltd., Bath Road, Cippenham, Slough, Bucks.

Pexone. No. 577118. Class 50. Compounded synthetic resin in the form of sheets, rods and tubes.—British Xylonite Co., Ltd., Hale End, E.4.

Transpex. No. 577283. Class 50. Material composed wholly or mainly of synthetic resin and sold in sheets or blocks and in mouldable powder form.—I.C.I. (Fertilisers and Synthetic Products), Ltd., Imperial Chemical House, Millbank, Westminster, S.W.1.

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1935/36.	1936/37.	1935/36.	1936/37.	1935/36.	1936/37.	1935/36.	1936/37.	
		£	£	£	£	£	£			
Barking	W. E. Kidner	97,690	106,228	70,815	74,232	13,915	18,682	16,767	19,732	17.7
Bath	J. W. Spark	166,341	175,406	108,521	126,533	26,881	15,732	44,119	49,089	11.2
Birmingham	F. Forrest	2,613,044	2,868,963	1,718,480	1,909,805	255,341	363,207	615,749†	707,990†	14.9
Blackburn	R. H. Harral	234,440	242,446	123,645	119,470	21,147	32,278	39,577	45,434	14.8
Bolton	H. E. Annett	346,208	389,968	273,905	284,973	32,669	60,288	86,841	96,353	10.9
Bromley	W. G. Trend	99,597	115,535	64,420	75,936	10,961	9,657	13,456	16,238	20.6
Bury St. Edmunds ...	A. E. Knights	28,145	29,189	14,992	16,667	3,036	573	3,088	3,486	11.4
Carlisle	C. W. Salt	121,677	135,895	87,868	93,067	2,773*	6,662	21,928	25,318	15.5
Chester	S. E. Britton	145,499	155,087	99,848	103,724	992*	3,082	21,044	24,438	16.1
Dover	R. C. Harpur	66,115	67,424	41,099	47,174	5,791	1,938	5,604	6,333	13.0
East Ham...	W. R. Elliott	183,136	195,217	123,238	131,039	2,901	5,490	25,904	27,727	7.0
Epsom and Ewell ...	H. W. Watts	60,297	70,284	39,412	49,725	1,493	1,917	7,698	8,964	16.4
Hampstead	H. Brierley	198,782	213,035	169,538	189,795	28,793	21,821	38,432	41,985	9.2
Hastings	A. J. Ryan	221,126	236,501	148,580	154,159	11,562	19,343	41,104	46,840	13.9
Ipswich	H. E. Blackiston	224,142	253,549	148,596	169,356	29,390	34,266	43,719	50,961	16.5
Kirkcaldy	O. F. Francis	42,305	44,683	30,595	35,284	946*	372*	8,547	8,905	4.1
Leeds	C. Nelson Hefford ...	961,258	1,020,448	424,145	463,863	106,124	112,411	230,686†	247,835†	7.4
Lincoln	F. Newey	107,394	122,582	77,357	87,328	9,451	2,097	25,467	28,052	10.1
Manchester	H. C. Lamb	2,067,112	2,109,449	1,449,981	1,494,518	129,011	147,671	498,434†	508,932†	2.1
Oxford	H. G. Fraser	173,936	206,810	110,280	147,285	22,843	20,346	36,874	46,473	26.0
Poplar	R. Illingworth	289,253	311,786	195,368	212,768	39,869	34,300	55,905	63,035	12.7
Rawtenstall	J. E. Shepherd ...	101,382	96,911	75,862	70,587	3,911	5,232	18,343	19,405	5.7
St. Pancras	R. Lee	394,662	414,637	248,130	273,662	37,684	28,889	63,886	72,246	13.0
Salford	L. Romero	425,488	451,365	239,417	265,193	30,832	34,475	102,178	108,419	6.1
Southport	E. Moxon	118,033	123,900	81,037	79,831	19,405	26,087	20,323	21,874	7.6
Spenborough	A. Pickersgill	23,617	24,230	15,486	15,821	2,700	3,401	3,441	3,687	7.1
Stretford	T. A. Kerr	381,029	414,511	282,828	310,072	12,344	15,217	143,977	157,647	9.4
Sunderland	W. A. Royle	206,512	227,185	110,766	124,781	26,497	31,280	47,617†	56,832†	19.3
Wolverhampton	T. A. G. Margary ...	437,449	479,382	303,605	341,375	23,598	13,391	140,659	155,675	10.6
Worcester	C. M. Shaw	130,208	146,577	83.712	86,017	9,432	24,913	24,385	28,993	18.9

* Net loss. † Excluding supplies to the C.E.B.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Houses (80), Seatons Field, Penparke; borough surveyor, Smithfield Road.

Addington.—Houses (64), Tideswell Road; Bennett & Worskett, 73, Gower Street, London, W.C.1.

Alton (HAMPSHIRE).—Cinema, Normandy Street, for the Union Cinemas, Ltd., Union House, 15, Regent Street, London, S.W.1.

Bacup.—School, Blackthorn, with electrical work; H. Cropper, architect, 2, Holmes Drive, Bacup.

Banbury.—Houses (134), King's Road and Middleton Road; borough surveyor, Municipal Buildings, Marlborough Road.

Banstead (SURREY). — Hospital and convalescent home (£200,000), for the Princess Elizabeth of York Hospital for Children; H. S. Goodhart-Rendel, architect, Crawford Street, London, W.1.

Bedford.—School, London Road estate, for E.C.

Bedfordshire.—Police station, quarters, &c., Kempston, for C.C. (£12,000); H. C. Janes, Ltd., builders, Luton. School, Burr Street, and extensions to Dunstable school, for County E.C.; Meads Estates, Ltd., builders, Princess Street, Dunstable.

Bellingham.—Secondary school (£61,840); L.C.C. architect, County Hall, Westminster, London, S.E.1.

Birmingham.—Houses (57), five sites; H. J. Manzoni, city surveyor, Council House, Birmingham. Airport buildings, Elmdon (£89,250); city engineer. Development (268 acres), Perry Barr; First National Housing Trust, Ltd. Factory, Highlands Road, Shirley, for the Gear Grinding Co., Anne Street, Smethwick; Wood, Kendrick & Reynolds, architects, 57, Colmore Row, Birmingham. Flats, Emily Street (£164,761); H. G. Dyke, Ltd. Rebuilding premises, Station Street, for W. H. Smith & Son, Ltd., Strand House, Portugal Street, London, W.C.1; Blow & Peters, builders, St. Albans.

Blackpool.—Swimming bath, Pembroke estate (£25,000); H. Joyce & Sons, Ltd., builders, Lytham St. Annes.

Caerphilly.—Houses (40), Grange site; U.D.C. surveyor, Council Offices, Mountain Road.

Camborne.—Houses (78), Killier's Fields Pool; U.D.C. surveyor, Station Hill, Redruth.

Carlisle.—Additions to Upperby Council school, for City Council; city architect.

Castle Donington (DERBYSHIRE).—Houses (30), the Barroon; W. A. Robertson, architect, Kegworth, near Derby.

Cheadle.—Houses, Larkhill Farm site; W. G. West, builder, Highfield Park estate, Bredbury.

Cheltenham.—Factory, Staverton, for Rotor Airscrews, Ltd.; W. G. Phillips, architect, Victoria Street, London, S.W.1.

Christchurch.—Cabinet factory, Somerford Road, for Hardy Equipments, Ltd.

Clapham Junction.—Cinema (£100,000), for the Bernstein Theatres, Ltd.; Bovis, Ltd., builders, South Audley Street, London, W.1.

Croydon.—Enlargement to Woodside school (£19,500), for E.C.

Darfield (BARNSLEY).—Houses (50); J. W. Whitehead, U.D.C. surveyor, Council Offices, Wombwell.

Denton.—Houses (60), Moss Farm estate, for Eaton & Co. (Denton), Ltd., Grey Street, Manchester Road.

Devonshire.—Enlargement to Grammar school, Teignmouth (£18,238), for County E.C.

Dewsbury.—Branch business premises, Ravenshouse Road, extensions and alterations to Bywell Road branch, for the Dewsbury Pioneers' Industrial Society, Ltd.; secretary, 43, Northgate.

Dudley.—Flats, Pitfield Row, and houses, Rosland and Cole Street estates, and police building; Webb & Gray, architects.

Dundee.—Houses and shops, Mid Craigie; Stenson & Co., 26, Carnegie Street.

Ealing.—Houses (44), Delamere Road; Bloomfield Building Co., Ltd., Warwick Dene estate, Ealing Common, London, W.5. Houses (34), Ribblesdale Avenue; Home Development Estate, Ltd. Rebuilding Central school, enlarging Ravenor school and school, Cuckoo estate, for E.C.

Exeter.—Extensions to Devon and Exeter Hospital, Southernhay; L. T. Moore, Raymond Buildings, Gray's Inn, London, W.C.1.

Galston (AYRSHIRE).—Houses (100); Gabriel Steel, architect, 14, Glasgow Road, Kilmarnock.

Gateshead-on-Tyne.—Factory, North-Eastern Trading estate, for the Celluware Supply Co., Ltd.; H. E. Pitt, Ltd., builders, Leopold Street, Millfield, Sunderland. Factory, Team Valley Trading estate, for W. Frost and Co., St. Nicholas' Buildings, Newcastle-on-Tyne.

Glasgow.—Palace of Art, restaurant, &c., Empire Exhibition, Bellahouston Park; W. A. M'Leod, Ltd., builders, Edinburgh, 1.

Great Yarmouth.—Extensions to Council Office (£19,501); borough engineer.

Hereford.—Hospital, mortuary and nurses' quarters (£68,836), with electrical work; W. J. Bowers & Co., builders, Hereford.

Hertfordshire.—School, Cuffley (£15,300), for C.C.; Allen Fairhead & Sons, Ltd., builders, Enfield.

Heywood (LANCASHIRE).—Houses (188), two sites; borough surveyor, Municipal Buildings.

Hindley.—Houses (86), Sandy Lane; J. Gerrard & Sons, Ltd., builders, Pendlebury Road, Swinton, Lancashire.

Hounslow.—Rebuilding business premises, High Street, for Platts Stores, Ltd.; A. P. Lloyd, architect, 71, Lincoln's Inn Fields, London, W.C.2.

Irish Free State.—(SLIGO).—Houses (136), Abbeyquarter, for the Sligo Corporation, Town Hall; McDonnell & Dixon, architects, 20, Ely Place, Dublin.

Jarrow-on-Tyne.—Public library; borough engineer.

Keighley.—Houses (46), Gilstead; surveyor, Barclays Bank Chambers.

Leadgate.—School; F. Willey, architect, 34, Old Elvet, Durham.

Leeds.—Factory, for John Waddington, Ltd.; W. P. Peters, architect, 89, Albion Street.

Litherland.—Houses (94); U.D.C. surveyor, Sefton Road, Waterloo.

Liverpool.—Cinema, Coronation Road, Liverpool Road, Great Crosby; Rowland Stubbs, George Bradbury & Sons, architects, 14, Cook Street.

London.—(BETHNAL GREEN).—Public hall (£27,500); borough engineer. (FULHAM).—Dwellings, Field Road (£50,390) and North End Road (£50,900); borough engineer. (HAMMERSMITH).—School, White City; L.C.C. architect, County Hall, Westminster, S.E.1. (LEWISHAM).—School, Whitefoot Lane estate; L.C.C. architect. (ST. MARYLEBONE).—Buildings, 376-384, Oxford Street; North, Robin & Wilsdon, Townsend House, Greycourt Place, S.W.1. (STEPNEY).—Tenements (100), Beccles Street (£65,575); borough engineer. (WESTMINSTER).—Extensions to Technical Institute (£62,780); L.C.C. architect. Rebuilding, 21, St. James's Square; Mewes & Davis, 1, Old Burlington Street, W.1.

Luton.—Police court and station (£29,042); borough engineer.

Maghull.—Cinema, hotel and shops near Liverpool Road, Liverpool, for the Alt Park Estate, Ltd.; A. E. Shennan, architect, North House, North John Street, Liverpool.

Manchester.—Development of Ringway airport (£61,912); city engineer. Redevelopment of Ardwick and New Cross areas (£110,084); city architect.

Marston (BEDFORDSHIRE).—Houses (200); Marston-Ridgmont Properties, Ltd.

Middlesbrough.—Houses (365), for the Sutton Dwellings Trust, Ltd.; Kettlewell, Son & Co., Ltd., builders, Hull.

Middlesex.—School, Kenmore Park, Harrow (£33,042); county architect.

Northern Ireland.—(COOKSTOWN).—Large factory (£50,000); Northern Ireland Farmers' Curing Co.

Northumberland.—Alterations to Lemington Secondary school for C.C.; county architect, County Hall, Newcastle-on-Tyne.

Penistone.—Houses (50), (£20,478); C. B. Potter & Sons, Ltd., builders, Doncaster Road, Barnsley.

Portsmouth.—Extensions to factory, Queen Street, for Holbrook & Son, Ltd.; R. H. P. Bevis, architect, Elm Grove Chambers, Southsea.

Rowley Regis.—School, Grace Mary estate, Tividale, for E.C.; Education Offices, Old Hill, Cradley Heath.

Royton (OLDHAM).—Houses (28), Mill Street site; U.D.C. surveyor, Town Hall.

Sheffield.—Cinema, Errington Road and Eastern Avenue, Arbourthorne (£20,000), for the Sheffield and District Cinematograph Theatres, Ltd.; W. Robson, Ltd., builders, Bamforth Street, Sheffield.

Shildon (Co. DURHAM).—Houses (100), for the North-Eastern Housing Association; J. W. Hanson & Sons, architects, 18, Eldon Square, Newcastle-on-Tyne.

Shirley.—Factory, for Co-operative Wholesale Society, Ltd.; architects' department, 1, Balloon Street, Manchester.

Slough.—Houses, Kenrick Road; E. H. Stile & Son.

Stockport.—Cinema, Macclesfield Road, Hazel Grove, for Marcliffe Cinema (Knutsford), Ltd.

Stockton-on-Tees.—Houses, &c., (24 acre site) near Durham Road, for S. Cohen, and development of (23 acre site), Oxbridge Lane, for S. Curry; G. P. Stainsby, architect, 25, High Street.

Stourport.—Houses (114), Manor Farm estate; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

Suffolk.—Extensions to County Hall, Ipswich (£33,333), for C.C.; G. A. Kenney & Sons, builders, Burrell Road, Ipswich.

Swanley.—Extensions to White Oak Hospital (£40,250); L.C.C. architect, County Hall, Westminster, London, S.E.1.

Taunton.—Houses (32), Leycroft Road; borough surveyor, Municipal Offices, Taunton.

Tynemouth.—Two schools, Cullercoats, for E.C. and R.C. schools, North Shields and Chirton; borough engineer.

Waddon.—Two factories, Progress Way; Croydon Factory Estate, Ltd.

Walisend-on-Tyne.—Houses (90), East Farm estate; W. Stockdale, architect, Howard Street, North Shields.

Ware.—Houses (66), various sites; L. J. Dale, R.D.C. surveyor, 97, New Road.

Warrington.—Extensions to South Avenue, for United Velvet Cutters' Association, Ltd.; Booth & Son, builders, Hyde, Cheshire.

Washington (Co. DURHAM).—Houses (60); J. Gardner, Ltd., builders, Gateshead-on-Tyne.

Wellington (SHROPSHIRE).—Houses (72), Arleston Lane estate; S. Walker, U.D.C. surveyor, Council Offices. Houses (52), Hadley Hollow, Ketley and Wrockwardine; J. H. T. Hickman, architect, 1, Market Street, Wellington.

Wells.—Houses (24); R. Vallis, architect, Monmouth House, Frome.

West Bromwich.—Cinema, Charlemont estate; E. S. Roberts, architect, Lombard House, Great Charles Street, Birmingham.

West Hartlepool.—Houses (24), South Street; borough engineer. Modernisation of Grand Hotel, for the London & North-Eastern Railway; Tarran Industries, Ltd., builders, Hull.

West Thurrock (ESSEX).—Factory, London Road, for Magnet Joinery, Ltd., 6, Whitley Street, Bingley, Yorkshire.

Whitley Bay.—Council offices; U.D.C. surveyor.

Widnes (LANCASHIRE).—Houses (100), Lowerhouse Lane; J. Holt, surveyor, Town Hall.

Worcester.—Extension to Worcester College of the Blind, including gymnasium and assembly hall (£30,000); Elcock & Sutcliffe, architects, Adam House, Strand, London, W.C.2.

Yorkshire.—Secondary school for girls, Sandybed Lane, Scarborough, for North Riding E.C.; secretary, Education Offices, Northallerton.